

# **Pattern Recognition Classification of Early Voting Ballot (EVB) Return Envelope Images for Signature Presence Detection**

*An Engineering Systems Approach to Identify Anomalies to Advance Integrity of U.S. Election Processes*

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**PRESENTED TO**



**Arizona State Senate**

# *Agenda*

- Executive Summary
- Background
- Maricopa EVB Results
- Scope of Audit & EchoMail Analysis
- EchoMail Results
- Comparative Analysis
- Key Findings and Anomalies
- Questions for Maricopa Election Officials
- Conclusion & Summary
- Conclusions



# *Executive Summary*

- The Early Voting Ballot (EVB) Return Envelope is the *protective vehicle* by which the EVB is transported and processed
- The authentication/verification of the Signature on the EVB return envelope is critical to reliability of the process
- This audit reveals anomalies raising questions on *the verifiability of the Signature Verification Process.*

## *Background*



# *Author's Expertise & Bio<sup>1</sup>*

- Four M.I.T. degrees: PhD, SMME, SMVS, SBEE
- Inventor of Email, Fulbright Scholar, Lemelson-MIT Finalist, Westinghouse Science Honors Recipient<sup>2,3</sup>
- Nominee for National Medal of Technology & Innovation
- 40+ years of experience in pattern recognition and classification of diverse signals and signatures across industries and applications:
  - Industries: Biology & Medicine; Engineering: Aeronautics, Civil, Electrical; Banking & Finance; Military
  - Applications: Handwriting recognition on bank checks, electronic document e.g. email analysis and categorization, ultrasonic and radar wave signature classification for non-destructive evaluation (NDE), speech analysis for tadooma signature identification, biomarker patterns analysis for efficacy of combination therapy, sleep pattern signature categorization for identification of SIDS patients, signal detection of fluid flow anomalies in fluidized bed reactors
- Winner of White House competition for automatic classification of email
- Seven successful high-tech companies:
  - EchoMail - Pattern recognition classification of documents (1994-Present)
  - CytoSolve - Computational modeling (2007-present)
- Patents, books, and publications in peer-reviewed high-impact journals: IEEE, IJPRAI, Nature Neuroscience, CELL Biophysical, etc.
- Invited Distinguished Lectures: NSF, NIH, FDA, Harvard, MIT Presidential Fellows Lecture

<sup>1</sup>Dr. Shiva Ayyadurai, Biography and Curriculum Vitae: <https://vashiva.com/about-va-shiva-ayyadurai/>

<sup>2</sup>Facts on the invention of email, <https://www.inventorofemail.com/thefacts/>

<sup>3</sup>The Man Who Invented Email, TIME, <https://techland.time.com/2011/11/15/the-man-who-invented-email/>



# *Systems and Modeling*



Reality

The System

# *Systems and Modeling*



Reality

The System



Model

The Signal

# ***Sudden Infant Death Syndrome***

*Signature Detection of Abnormal Sleep Patterns to Prevent Baby's Death (1978 – 1984)*

**Baby**



**The System**



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EchoMail, Inc. Proprietary and Confidential.

# ***Sudden Infant Death Syndrome***

*Signature Detection of Abnormal Sleep Patterns to Prevent Baby's Death (1978 – 1984)*

**Baby**

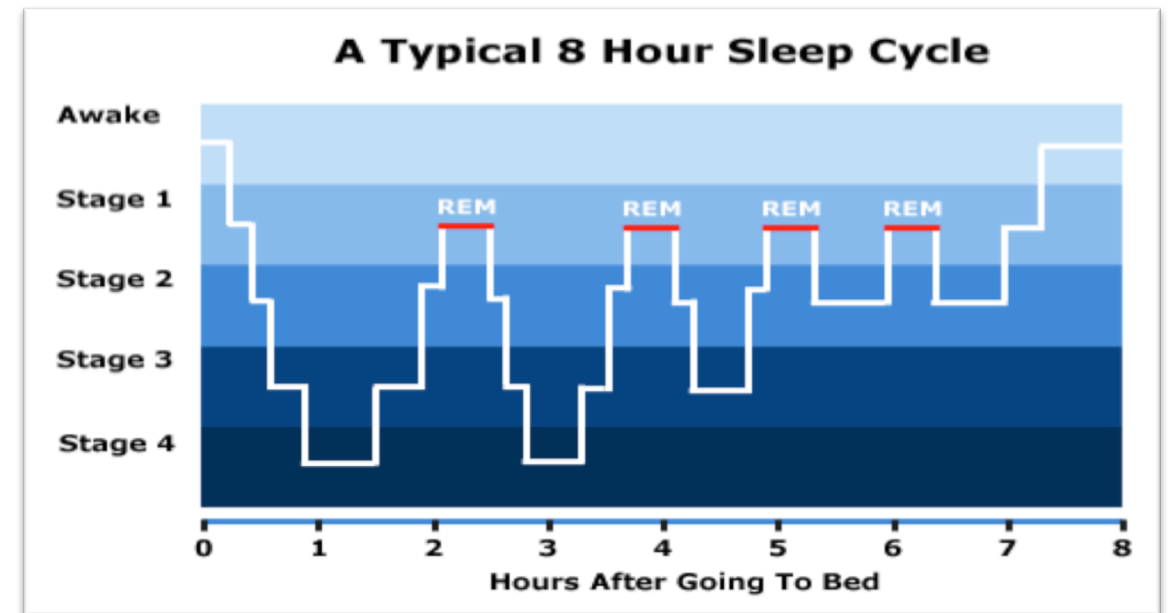


**The System**



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**Sleep Signature Patterns**



**The Signal**

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# ***Tadoma***

*Signal Detection of Non-Vocal Communication for Supporting Deaf-Blind (1983-1986)*

## **Tadoma – Deaf-Blind Communication**



### **The System**



# *Tadoma*

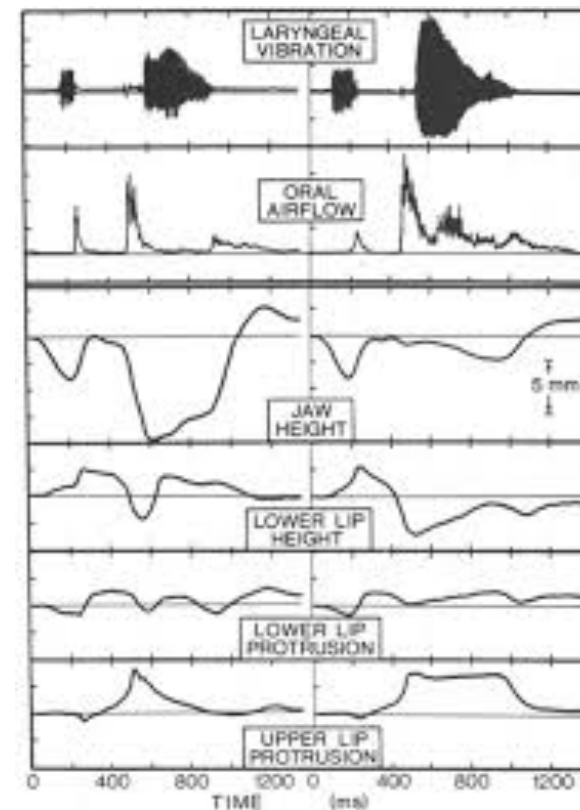
*Signal Detection of Non-Vocal Communication for Supporting Deaf-Blind (1983-1986)*

## Tadoma – Deaf-Blind Communication



The System

## Multiple Signals from Mouth

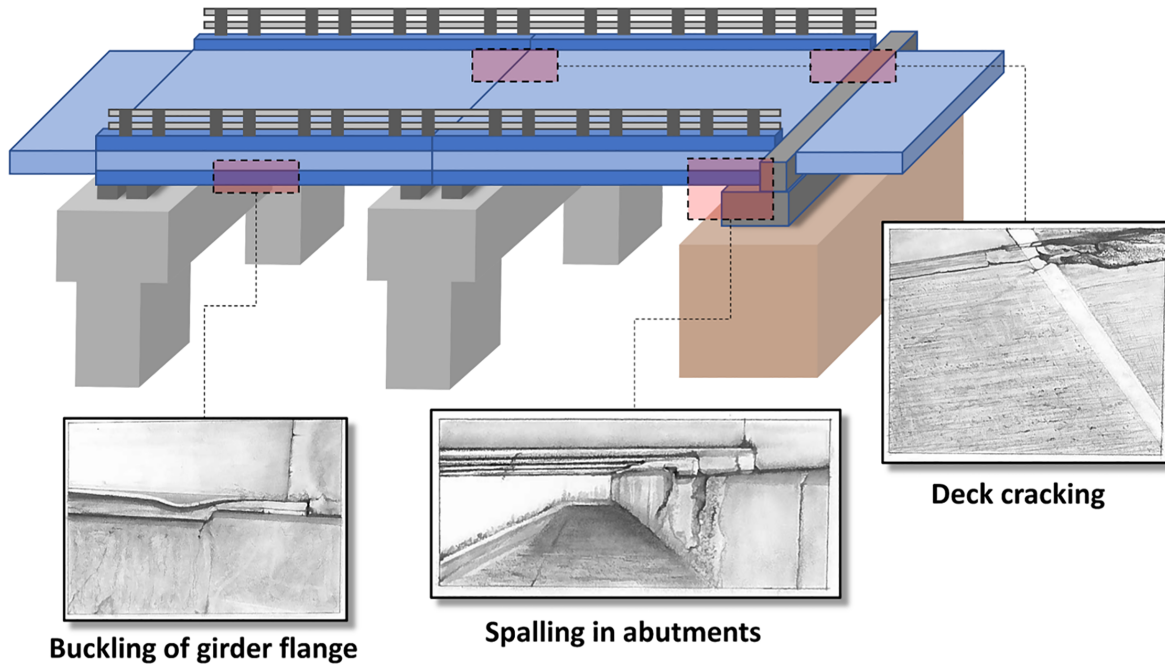


The Signal

# ***Bridge Deck Deterioration***

*Signal Detection of Flaws in Bridges for Prediction Bridge Deck Failures (1986-1988)*

## **Bridge Deck**

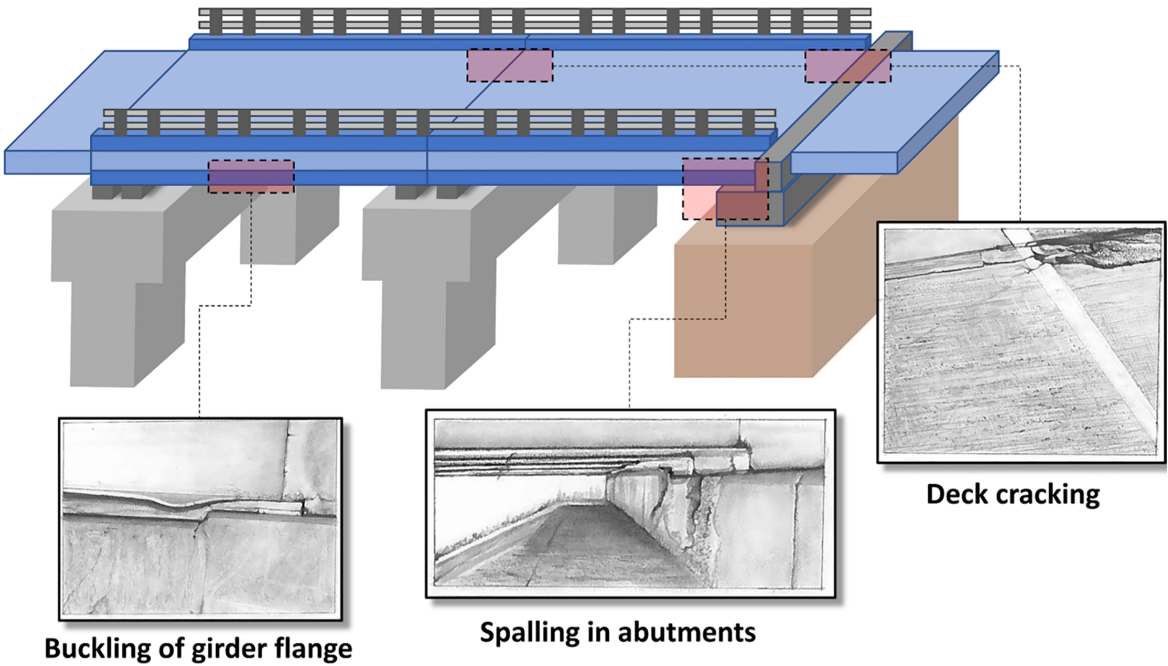


## **The System**

# Bridge Deck Deterioration

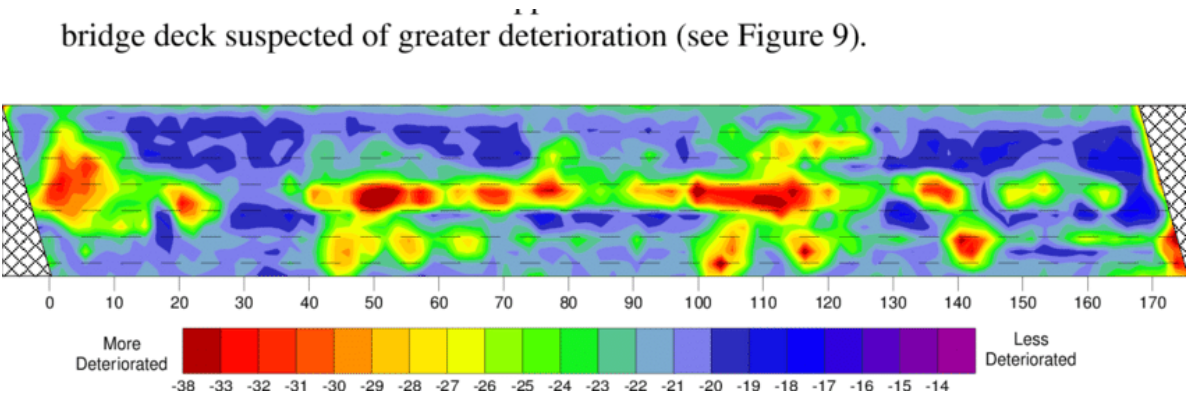
*Signal Detection of Flaws in Bridges for Prediction Bridge Deck Failures (1986-1988)*

## Bridge Deck



## The System

## Bridge Deterioration Signatures



## The Signal

# ***Non-Destruction Evaluation***

*Signal Detection of Ultrasonic Signals for Preventative Maintenance of Aircraft Wings (1988-1990)*

## **Aircraft Wings**



## **The System**



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# ***Non-Destruction Evaluation***

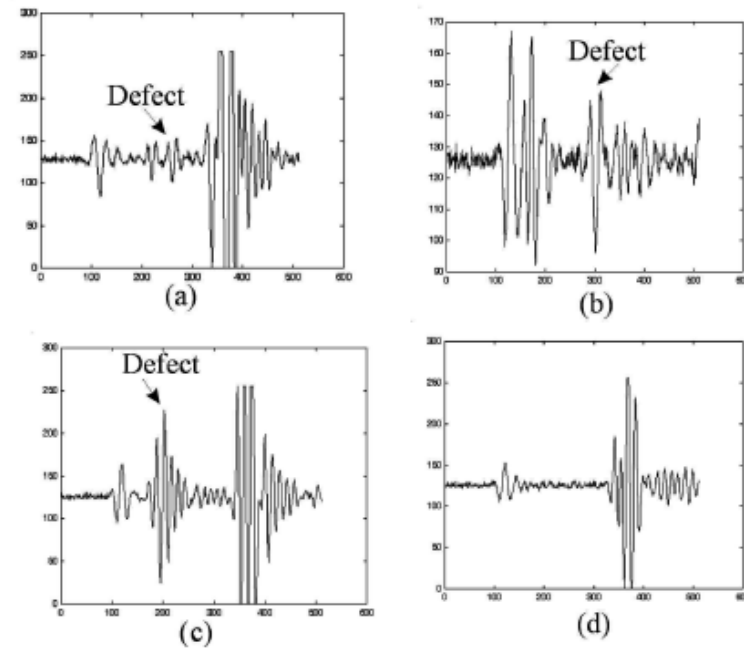
*Signal Detection of Ultrasonic Signals for Preventative Maintenance of Aircraft Wings (1988-1990)*

## **Aircraft Wings**



## **The System**

## **Aircraft Wing Ultrasonic Signatures**

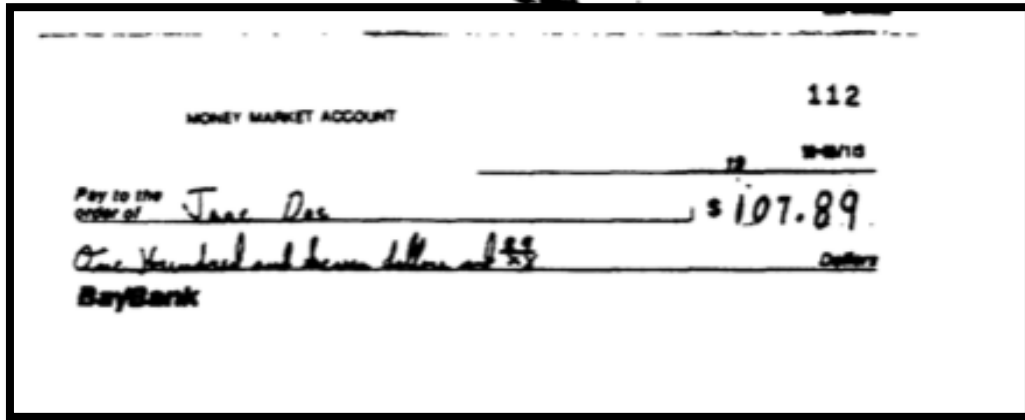


## **The Signal**

# *Handwritten Numerals on Bank Checks*

Integrated Architecture for Recognition of Handwritten Numerals on Bank Checks (1992-1994)

## Bank Checks



## The System



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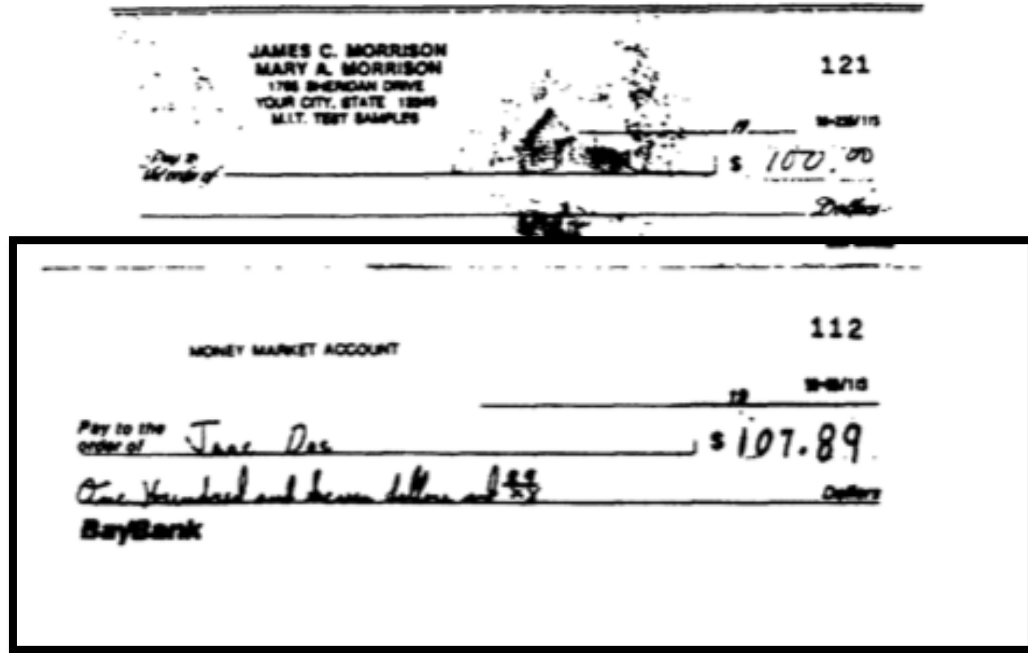
EchoMail, Inc. Proprietary and Confidential.



# Handwritten Numerals on Bank Checks

Integrated Architecture for Recognition of Handwritten Numerals on Bank Checks (1992-1994)

## Bank Checks

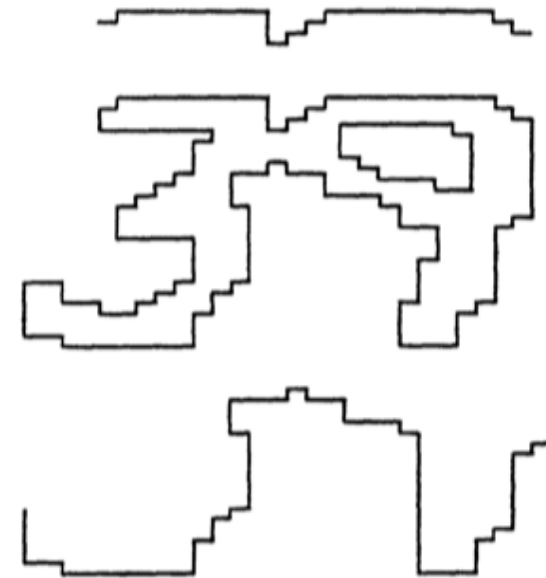


## The System



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## Detection of Numerals



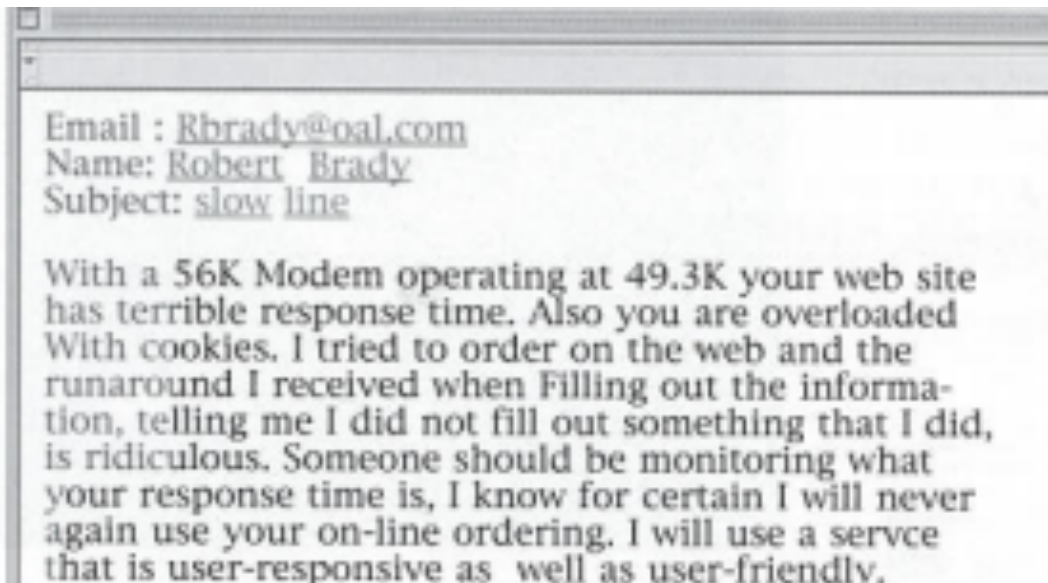
## The Signal

EchoMail, Inc. Proprietary and Confidential.

# ***EchoMail®: Automatic Document Analysis and Classification***

## *Signal Detection of Email Signals for Automatic Categorization (1992 - Present)*

### **Email Message**



### **The System**

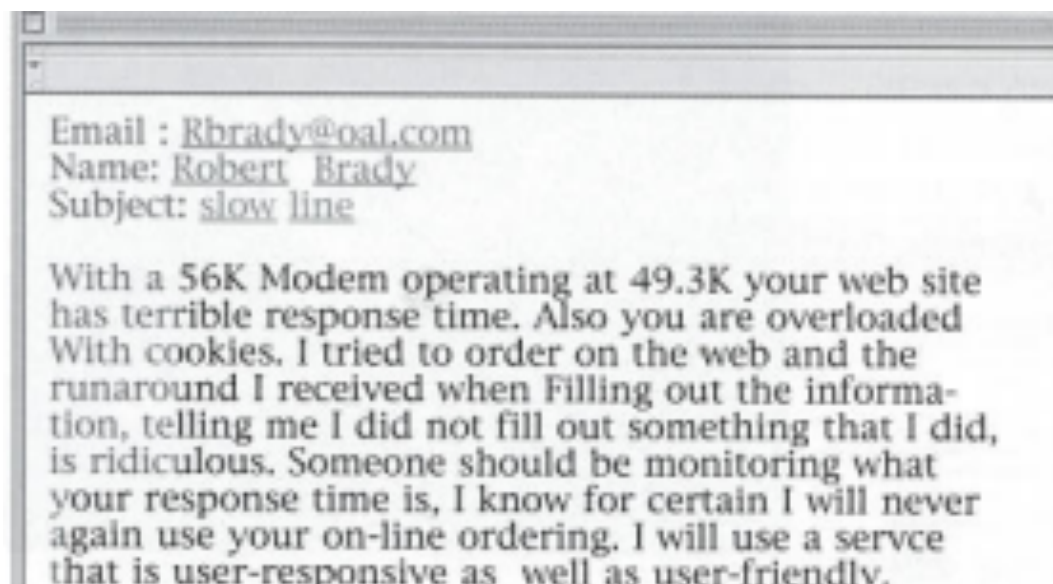




# *EchoMail®: Automatic Document Analysis and Classification*

## *Signal Detection of Email Signals for Automatic Categorization (1992 - Present)*

### Email Message



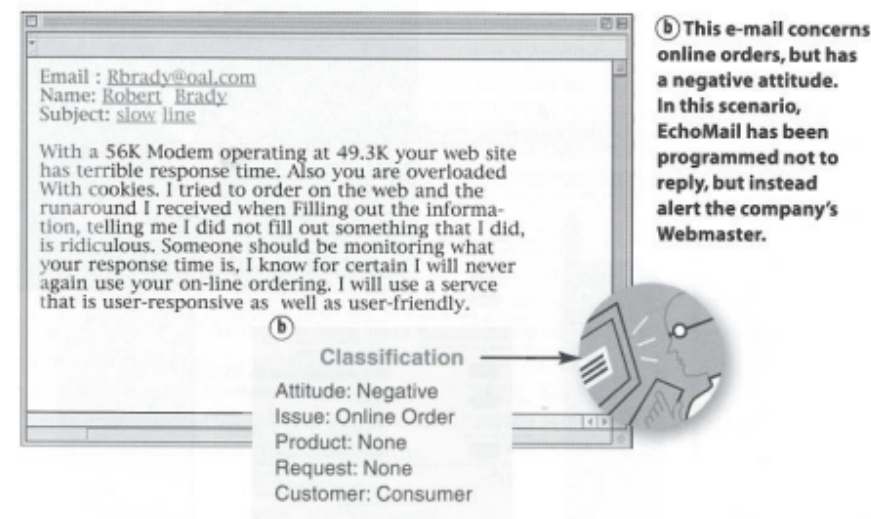
### The System



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### Email Signals

(Attitude, Issue, Product, Request, Customer)



### The Signal

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# ***CytoSolve®: Discovering Combinations That Work***

*Signal Detection of Combination Therapies That Alleviate Disease (2007 - Present)*

## **Combination of Foods**



## **The System**

# *CytoSolve®: Discovering Combinations That Work*

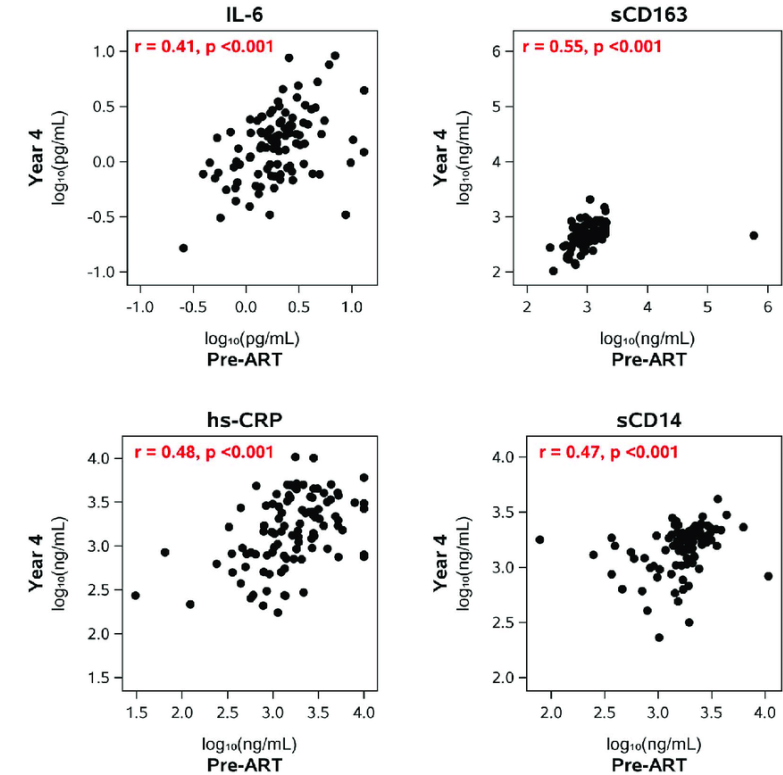
*Signal Detection of Combination Therapies That Alleviate Disease (2007 - Present)*

## Combination of Foods



The System

## Biomarkers That Reduce Inflammation



The Signal

# *Systems and Modeling*



Reality

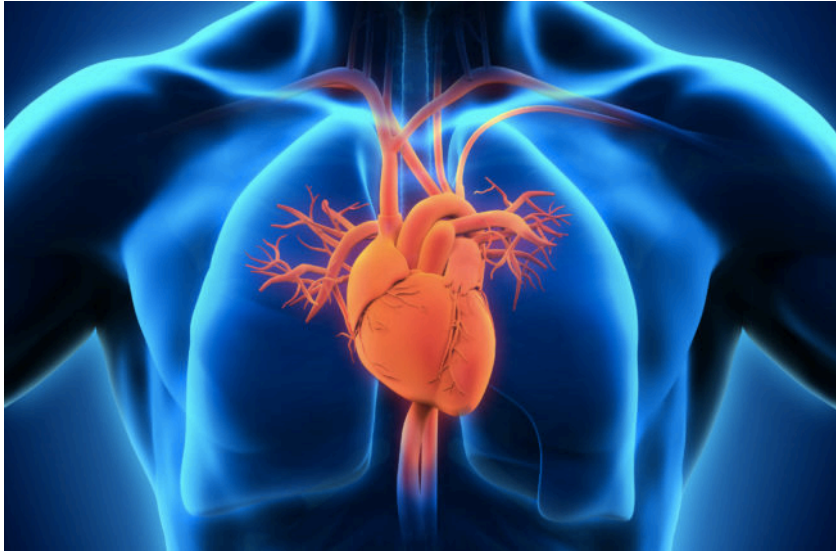
The System



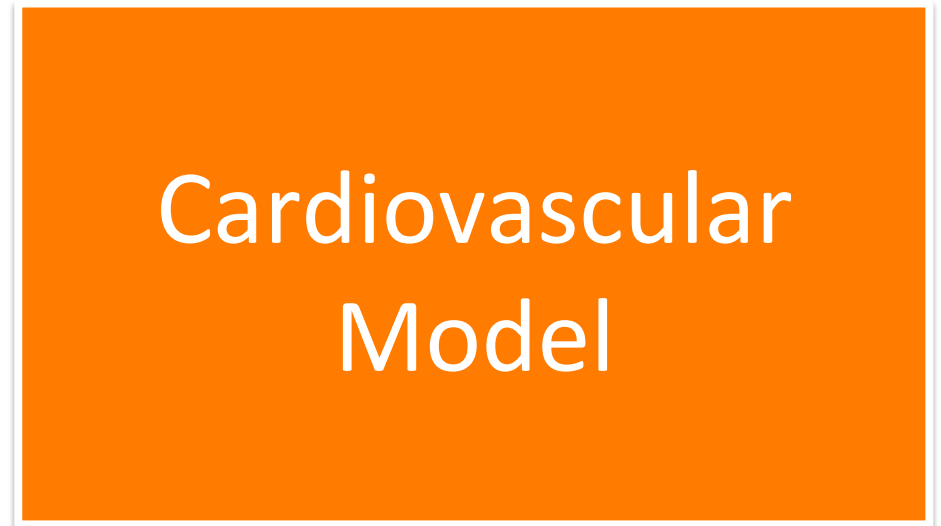
Model

The Signal

# *Systems and Modeling*



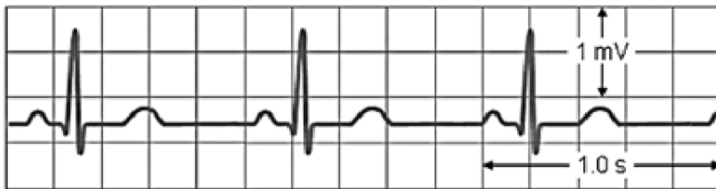
The System



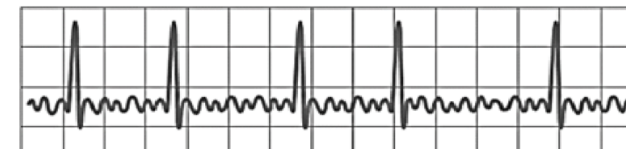
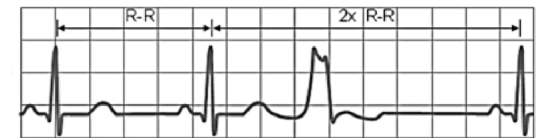
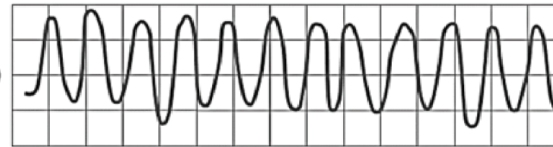
The Signal

# Cardiac Signature Detection & Classification

**NORMAL STATE**



**ABNORMAL STATE(S)**



# *Systems and Modeling*



Reality

The System



Model

The Signal

# *Early Voting Ballot (EVB) System*



EVB  
System

The System



# *Early Voting Ballot (EVB) System*



EVB  
System

The System



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EVB  
Return Envelope  
Images

The Signal

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# *Early Voting Ballot (EVB) System*

EVB  
System

NOV 3 2020 GENERAL ELECTION

**Name of Voter**

NOV 3 2020

BALLOT WILL NOT BE  
COUNTED WITHOUT  
YOUR SIGNATURE.  
POWERS OF ATTORNEY  
are not valid for voting  
purposes.

LA BOLETA NO SE  
TRAMITAR SIN SU  
FIRMA.  
PODER DE ABOGADO  
no es valido para fines  
de votación.

SIGN WITHIN THE BOX  
FIRME DENTRO DE LA CAJA

**Signature**

(PHONE, if signature is questioned)  
(TELEFONO, si la firma es cuestionada)

(DATE / FECHA)

Within U.S. - MAIL no later than 6 days prior to Election Day (noted on ballot)

The System

The Signal

# Early Voting Ballot Return Envelope

NOV 3 2020 GENERAL ELECTION

Name of Voter

8 21 19 57 18

BALLOT WILL NOT BE COUNTED WITHOUT YOUR SIGNATURE.

POWERS OF ATTORNEY are not valid for voting purposes.

LA BOLETA NO SE TRAMITAR SIN SU FIRMA.

PODER DE APOGADO no es valido para fines de votación.

VERIFIED & APPROVED MCTP

SIGN WITHIN THE BOX  
FIRME DENTRO DE LA CAJA

Signature

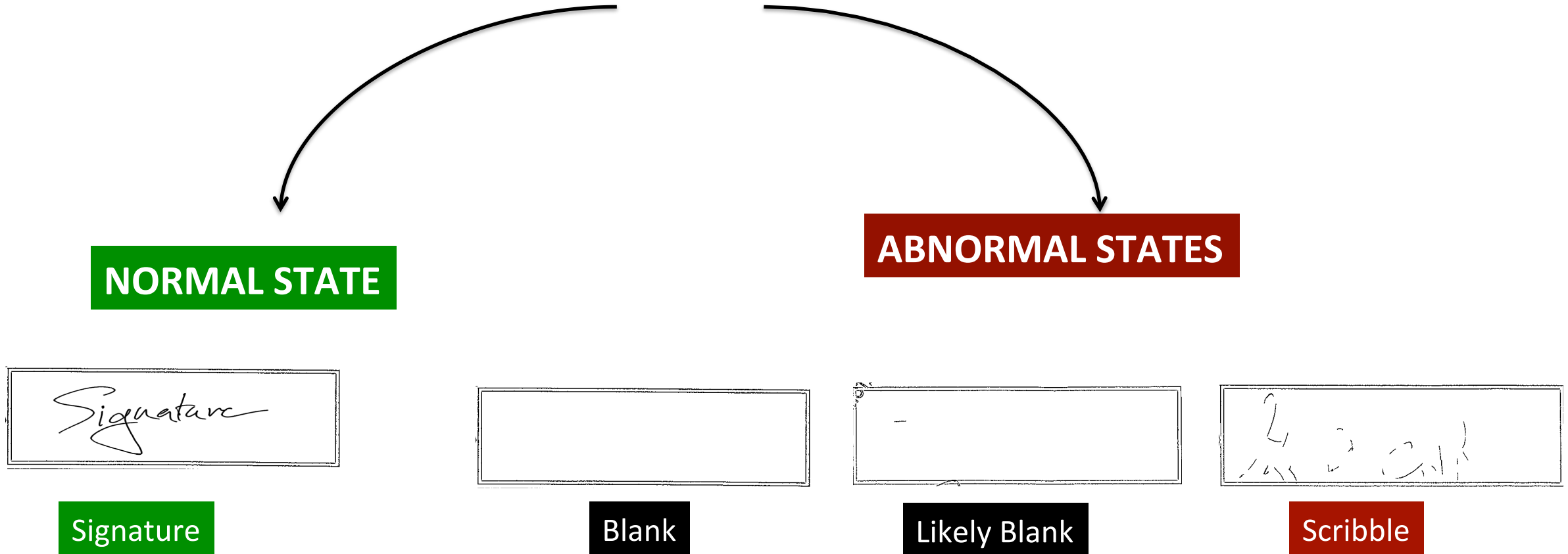
(PHONE, if signature is questioned)  
(TELEFONO, si la firma es cuestionada)

(DATE / FECHA)

Within U.S. - MAIL no later than 6 days prior to Election Day (noted on ballot)

Signature

# ***EVV Return Envelope Images Signature Detection & Classification***



# *Early Voting Ballot (EVB) System*

EVB  
System

NOV 3 2020 GENERAL ELECTION

**Name of Voter**

NOV 3 2020

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LA BOLETA NO SE TRAMITAR SIN SU FIRMA. PODER DE ABOGADO no es valido para fines de votación.

**SIGN WITHIN THE BOX**  
**FIRME DENTRO DE LA CAJA**

**Signature**

(PHONE, if signature is questioned)  
(TELEFONO, si la firma es cuestionada)


(DATE / FECHA)

Within U.S. - MAIL no later than 6 days prior to Election Day (noted on ballot)

The System

The Signal

# Early Voting Ballot (EVB) System

 MARICOPA COUNTY			
<b>VOTER EDUCATION REPORT</b>			
2020 PRIMARY & GENERAL ELECTION			
<b>GENERAL ELECTION</b>			
<b>VOTER TURNOUT</b>	<b>2020</b>	<b>2016</b>	
Voter Turnout	80.51%	74.43%	
Early Ballots Requested	2,160,412	1,497,565	
Early Ballots Verified and Counted	1,915,487	1,251,978	
Rejected Early Ballots			
Bad Signatures	587	1,456	
No Signatures	1,455	2,209	
Late Returns	934	1,536	

The System



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NOV 3 2020 GENERAL ELECTION

Name of Voter

NOV 3 2020

BALLOT WILL NOT BE COUNTED WITHOUT YOUR SIGNATURE. POWERS OF ATTORNEY are not valid for voting purposes.

LA BOLETA NO SE TRAMITAR SIN FIRMA. PODER DE ABOGADO no es valido para fines de votación.

SIGN WITHIN THE BOX  
FIRME DENTRO DE LA CAJA

Signature

(PHONE, if signature is questioned)  
(TELEFONO, si la firma es cuestionada)

(DATE / FECHA)

Within U.S. - MAIL no later than 6 days prior to Election Day (noted on ballot)

The Signal

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## ***Maricopa EVB Results***





MARICOPA COUNTY

# VOTER EDUCATION REPORT

2020 PRIMARY & GENERAL ELECTION

## GENERAL ELECTION

### VOTER TURNOUT

2020

2016

Voter Turnout

80.51%

74.43%

Early Ballots Requested

2,160,412

1,497,565

Early Ballots Verified and Counted

1,915,487

1,251,978

Rejected Early Ballots

Bad Signatures

587

1,456

No Signatures

1,455

2,209

Late Returns

934

1,536



# GENERAL ELECTION

## VOTER TURNOUT

2020

Voter Turnout	80.51%
Early Ballots Requested	2,160,412
Early Ballots Verified and Counted	1,915,487
Rejected Early Ballots	
Bad Signatures	587
No Signatures	1,455
Late Returns	934

1,918,463

## *Summary of Results from Maricopa County*

	<b>Maricopa Reported in 2020</b>
<b>Total Unique EVB Return Envelopes</b>	<b>1,918,463</b>

## *Summary of Results from Maricopa County*

	Maricopa Reported in 2020
<b>Total Unique EVB Return Envelopes</b>	1,918,463
<b>Signature Presence Detection</b>	
<b>No Signature Ballots</b>	(1,455)

## *Summary of Results from Maricopa County*

	Maricopa Reported in 2020
Total Unique EVB Return Envelopes	1,918,463
Signature Presence Detection	
No Signature Ballots	(1,455)
Total Ready for Signature Verification	1,917,008

## *Summary of Results from Maricopa County*

	Maricopa Reported in 2020
<b>Total Unique EVB Return Envelopes</b>	1,918,463
<b>Signature Presence Detection</b>	
<b>No Signature Ballots</b>	(1,455)
<b>Total Ready for Signature Verification</b>	1,917,008
<b>Signature Verification Process</b>	
<b>“Bad Signatures”</b>	(587)

## *Summary of Results from Maricopa County*

	<b>Maricopa Reported in 2020</b>
<b>Total Unique EVB Return Envelopes</b>	<b>1,918,463</b>
<b>Signature Presence Detection</b>	
<b>No Signature Ballots</b>	<b>(1,455)</b>
<b>Total Ready for Signature Verification</b>	<b>1,917,008</b>
<b>Signature Verification Process</b>	
<b>“Bad Signatures”</b>	<b>(587)</b>
<b>“Late Returns”</b>	<b>(934)</b>

## *Summary of Results from Maricopa County*

	<b>Maricopa Reported in 2020</b>
<b>Total Unique EVB Return Envelopes</b>	<b>1,918,463</b>
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<b>No Signature Ballots</b>	<b>(1,455)</b>
<b>Total Ready for Signature Verification</b>	<b>1,917,008</b>
<b>Signature Verification Process</b>	
<b>“Bad Signatures”</b>	<b>(587)</b>
<b>“Late Returns”</b>	<b>(934)</b>
<b>Total EVBs Verified and Counted</b>	<b>1,915,487</b>

## *Scope of Audit & EchoMail Analysis*





# *Systems Process for Early Voting Ballot (EVB) Return Envelope Processing*

Voter Submits Early Voting Ballot (EVB)

## *Systems Process for Early Voting Ballot (EVB) Return Envelope Processing*

Voter Submits Early Voting Ballot (EVB)

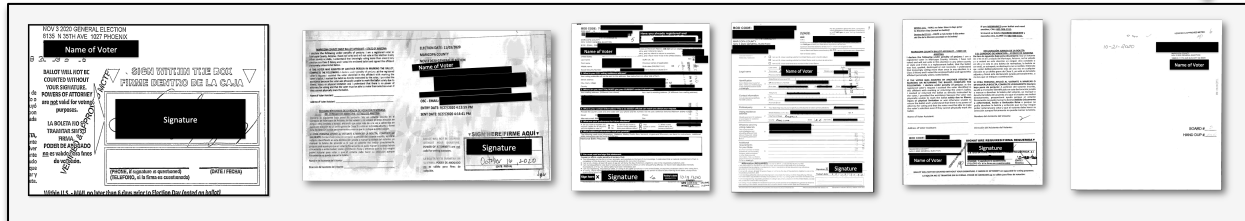


EVB Return Envelopes Are Scanned into Images

# *Systems Process for Early Voting Ballot (EVB) Return Envelope Processing*

Voter Submits Early Voting Ballot (EVB)

EVB Return Envelopes Are Scanned into Images

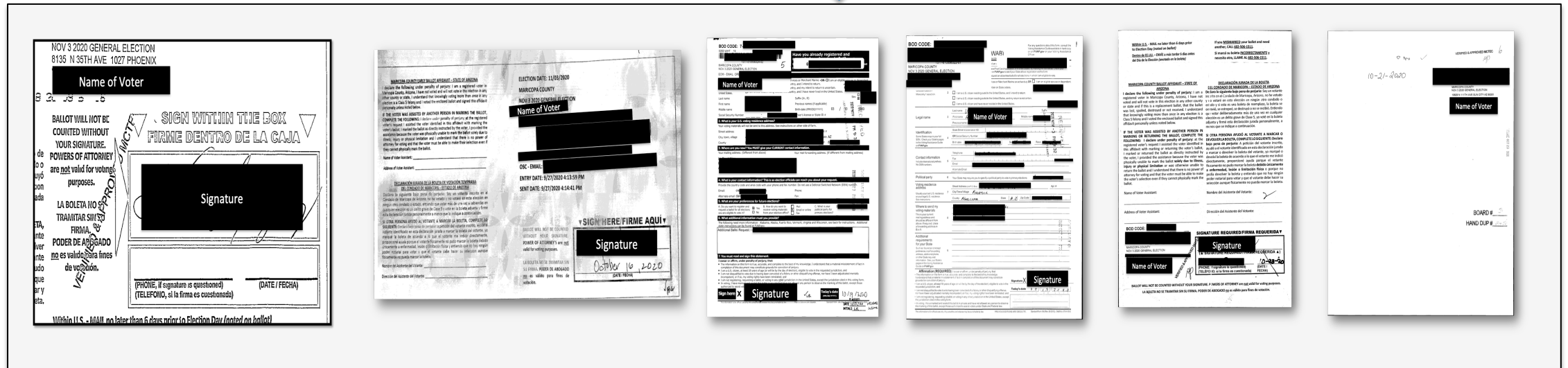


Six (6) different EVB return envelope formats

# Systems Process for Early Voting Ballot (EVB) Return Envelope Processing

Voter Submits Early Voting Ballot (EVB)

EVB Return Envelopes Are Scanned into Images



# Systems Process for Early Voting Ballot Return Envelope Processing

NOV 3 2020 GENERAL ELECTION

Name of Voter

8 21 13 57 18

BALLOT WILL NOT BE COUNTED WITHOUT YOUR SIGNATURE. POWERS OF ATTORNEY are not valid for voting purposes.

LA BOLETA NO SE TRAMITAR SIN SU FIRMA. PODER DE ABOGADO no es valido para fines de votación.

SIGN WITHIN THE BOX  
FIRME DENTRO DE LA CAJA

Signature

(PHONE, if signature is questioned)  
(TELEFONO, si la firma es cuestionada)

(DATE / FECHA)

Within U.S. - MAIL no later than 6 days prior to Election Day (noted on ballot)

Standard Image File (SIF)

# Systems Process for Early Voting Ballot (EVB) Return Envelope Processing

## Voter Submits Early Voting Ballot (EVB)

**MARICOPA COUNTY EARLY BALLOT AFFIDAVIT – STATE OF ARIZONA**

I declare the following under penalty of perjury: I am a registered voter in Maricopa County, Arizona, I have not voted and will not vote in this election in any other county or state, I understand that knowingly voting more than once in any election is a Class 5 felony and I voted the enclosed ballot and signed this affidavit personally unless noted below.

IF THE VOTER WAS ASSISTED BY ANOTHER PERSON IN MARKING THE BALLOT, COMPLETE THE FOLLOWING: I declare under penalty of perjury: at the registered voter's request I assisted the voter identified in this affidavit with marking the voter's ballot, I marked the ballot as directly instructed by the voter, I provided the assistance because the voter was physically unable to mark the ballot solely due to illness, injury or physical limitation and I understand that there is no power of attorney for voting and that the voter must be able to make their selection even if they cannot physically mark the ballot.

Name of Voter Assistant: \_\_\_\_\_

Address of Voter Assistant: \_\_\_\_\_

**DECLARACIÓN JURADA DE LA BOLETA DE VOTACIÓN TEMPRANA DEL CONDADO DE MARICOPA – ESTADO DE ARIZONA**

Declaro lo siguiente bajo pena de perjurio: Soy un votante inscrito en el Condado de Maricopa de Arizona, no he votado y no votare en esta elección en ningún otro condado o estado, entiendo que votar más de una vez a sabiendas en cualquier elección es un delito grave de Clase 5 y vote en la boleta adjunta y firmé esta declaración jurada personalmente a menos que lo indique a continuación.

SI OTRA PERSONA AYUDÓ AL VOTANTE A MARCAR LA BOLETA, COMPLETE LO SIGUIENTE: Declaro bajo pena de perjurio: a petición del votante inscrito, ayudé al votante identificado en esta declaración jurada a marcar la boleta del votante, yo marqué la boleta de acuerdo a lo que el votante me indicó directamente, proporcioné ayuda porque el votante físicamente no pudo marcar la boleta debido únicamente a enfermedad, lesión o limitación física y entiendo que no hay ningún poder notarial para votar y que el votante debe hacer su selección aunque físicamente no pueda marcar la boleta.

Nombre del Asistente del Votante: \_\_\_\_\_

Dirección del Asistente del Votante: \_\_\_\_\_

ELECTION DATE: 11/03/2020  
MARICOPA COUNTY  
NOV 3 2020 GENERAL ELECTION  
Name of Voter  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
OSC - EMAIL: \_\_\_\_\_  
ENTRY DATE: 9/27/2020 4:13:59 PM  
SENT DATE: 9/27/2020 4:14:41 PM

▼ SIGN HERE/FIRME AQUI ▼

BALLOT WILL NOT BE COUNTED WITHOUT YOUR SIGNATURE.  
POWER OF ATTORNEY'S are not valid for voting purposes.

LA BOLETA NO SE TRAMITAR SIN SU FIRMA. PODER DE ABOGADO no es válido para fines de votación.

Signature  
October 16, 2020  
(DATE / FECHA)

spa

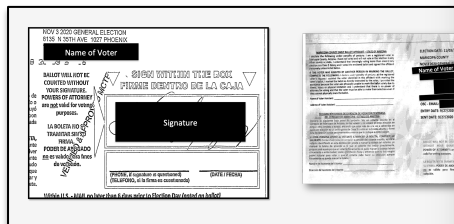
different EVB return envelope formats

UOCAVA Image File, Type A (UIF-A)

# Systems Process for Early Voting Ballot (EVB) Return Envelope Processing

Voter Submits

EVB Return Envelope



BOD CODE: 7- [REDACTED]  
0350 WHT 19 [REDACTED]  
1377-810506324-02 5  
MARICOPA COUNTY  
NOV 3 2020 GENERAL ELECTION  
EOM - EMAIL - CRB [REDACTED]

**Have you already registered and** [REDACTED]

**Name of Voter** [REDACTED]  
Services or Merchant Marine --OR-- ☐ I am an eligible spouse or dependent  
country, and I intend to return.  
country, and my intent to return is uncertain,  
United States, and I have never lived in the United States.

Last name [REDACTED] Suffix (Jr., II) [REDACTED]  
First name [REDACTED] Previous names (if applicable) [REDACTED]  
Middle name [REDACTED] Birth date (MM/DD/YYYY) 03 / 10 / 1983  
Social Security Number [REDACTED] Driver's license or State ID # [REDACTED]

**2. What is your U.S. voting residence address?**  
Your voting materials will not be sent to this address. See instructions on other side of form.  
Street address [REDACTED] # [REDACTED]  
City, town, village [REDACTED] State AZ  
County [REDACTED]

**3. Where are you now? You MUST give your CURRENT contact information.**  
Your mailing address. (Different from above) [REDACTED] Your mail forwarding address. (If different from mailing address) [REDACTED]

**4. What is your contact information? This is so election officials can reach you about your request.**  
Provide the country code and area code with your phone and fax number. Do not use a Defense Switched Network (DSN) number.  
Email: [REDACTED] Phone: [REDACTED]  
Alternate email: [REDACTED] Fax: [REDACTED]

**5. What are your preferences for future elections?**  
A. Do you want to register and request a ballot for all elections you are eligible to vote in? ☒ Yes ☐ No  
B. How do you want to receive voting materials from your election office? ☒ Mail ☐ Email or online ☐ Fax  
C. What is your political party for primary elections? [REDACTED]

**6. What additional information must you provide?**  
The following need more information: Alabama, Alaska, Puerto Rico, Vermont, Virginia and Wisconsin, see back for instructions. Additional state instructions can be found at EVAP.gov.  
Additional Ballot Request: [REDACTED]

**7. You must read and sign this statement.**  
I swear or affirm, under penalty of perjury, that:  
• The information on this form is true, accurate, and complete to the best of my knowledge. I understand that a material misstatement of fact in completion of this document may constitute grounds for conviction of perjury.  
• I am a U.S. citizen, at least 18 years of age (or will be by the day of election), eligible to vote in the requested jurisdiction, and  
• I am not disqualified to vote due to having been convicted of a felony or other disqualifying offense, nor have I been adjudicated mentally incompetent; or if so, my voting rights have been reinstated; and  
• I am not registering, requesting a ballot, or voting in any other jurisdiction in the United States, except the jurisdiction cited in this voting form.  
• In voting, I have marked and sealed this ballot in accordance with the instructions and have not allowed any person to observe the marking of this ballot, except those authorized to assist voters.

**Sign here** X **Signature** [REDACTED] **Today's date** (MM/DD/YYYY) 10/19/2020  
DATE 10/19/2020 INITIALS LR  
This information is for official use only. Any unauthorized release may be punishable by law. Previous editions are obsolete. Standard Form 186 (Rev. 11-2002) receive in time

(6) different EVB return envelope formats

UOCAVA Image File, Type B (UIF-B)

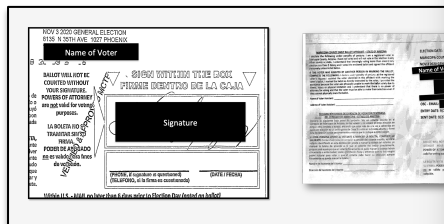




# Systems Process for Early Voting Ballot (EVB) Return Envelope Processing

Voter Submits

EVB Return Envelope



**BOD CODE:** [REDACTED]

**WAB)** [REDACTED]

**MARICOPA COUNTY**  
**NOV 3 2020 GENERAL ELECTION**

For any questions about this form, consult the Voting Assistance Guide available in hard copy or on **FVAP.gov** or your Voting Assistance Officer.

1. I am a U.S. citizen, at least 18 years of age (or will be by the day of the election), eligible to vote in the requested jurisdiction, and

2. I am not disqualified to vote due to having been convicted of a felony or other disqualifying offense, nor have I been adjudicated mentally incompetent, or if so, my voting rights have been reinstated; and

3. I am not registering, requesting a ballot, or voting in any other jurisdiction in the United States, except the jurisdiction cited in this voting form.

In voting, I have marked and sealed this ballot in private and have not allowed any person to observe the marking of this ballot, except those authorized to assist voters under State and Federal law.

This information is for official use only. Any unauthorized release may be punishable by law. PREVIOUS EDITIONS ARE OBSOLETE. Standard Form 186 (Rev. 08-2013), OMB No. 0704-0502

**Legal name** 3 Last name First name Middle name Suffix

**Identification** 4 State Driver's License or I.D. OR Social Security Number Birth date Sex Race

**Contact information** 5 Telephone Fax Email Alternate Email

**Political party** 6 Your State may require you to specify a political party to vote in primary elections

**Voting residence address** 7 Street Address (not P.O. Box) Apt. # City/Town/Village PHOENIX County MARICOPA State AZ Zip Code

**Where to send my voting materials** 8 This is your current mailing address and should be different from above. If required, place a forwarding address in Box 9.

**Additional requirements for your State** 9 Such as: future ballot receipt preference, mail forwarding address, additional phone, or other State required information. See your State's pages in the Voting Assistance Guide on FVAP.gov.

**Affirmation (REQUIRED):** I swear or affirm, under penalty of perjury, that the information on this form is true, accurate, and complete to the best of my knowledge. I understand that a material misstatement of fact in completion of this document may constitute grounds for conviction of perjury.

**Signature** [REDACTED]

**Today's date** 10/15/2020

different EVB return envelope formats

UOCAVA Image File, Type C (UIF-C)

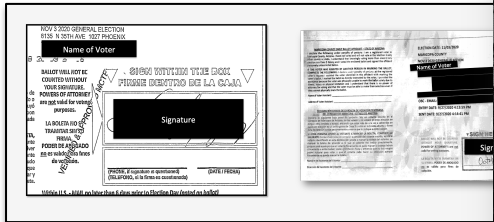




# Systems Process for Early Voting Ballot (EVB) Return Envelope Processing

Voter Submits Early Voting Ballot

EVB Return Envelope



Within U.S. - MAIL no later than 6 days prior to Election Day (noted on ballot)  
Dentro de EE.UU. - ENVÍE a más tardar 6 días antes del Día de la Elección (anotado en la boleta)

If you MISMARKED your ballot and need another, CALL 602-506-1511.  
Si marcó su boleta INCORRECTAMENTE y necesita otra, LLAME AL 602-506-1511.

MARICOPA COUNTY BALLOT AFFIDAVIT - STATE OF ARIZONA

I declare the following under penalty of perjury: I am a registered voter in Maricopa County, Arizona, I have not voted and will not vote in this election in any other county or state and if this is a replacement ballot, that the ballot was lost, spoiled, destroyed or not received. I understand that knowingly voting more than once in any election is a Class 5 felony and I voted the enclosed ballot and signed this affidavit personally unless noted below.

IF THE VOTER WAS ASSISTED BY ANOTHER PERSON IN MARKING OR RETURNING THE BALLOT, COMPLETE THE FOLLOWING: I declare under penalty of perjury: at the registered voter's request I assisted the voter identified in this affidavit with marking or returning the voter's ballot, I marked or returned the ballot as directly instructed by the voter, I provided the assistance because the voter was physically unable to mark the ballot solely due to illness, injury or physical limitation or was otherwise unable to return the ballot and I understand that there is no power of attorney for voting and that the voter must be able to make the voter's selection even if they cannot physically mark the ballot.

DECLARACIÓN JURADA DE LA BOLETA DEL CONDADO DE MARICOPA - ESTADO DE ARIZONA  
Declaro lo siguiente bajo pena de perjurio: Soy un votante inscrito en el Condado de Maricopa, Arizona, no he votado y no votaré en esta elección en ningún otro condado o estado y si esta es una boleta de reemplazo, la boleta se extravió, se estropeó, se destruyó o no se recibió. Entiendo que votar deliberadamente más de una vez en cualquier elección es un delito grave de Clase 5, yo voté en la boleta adjunta y firmé esta declaración jurada personalmente, a menos que se indique a continuación.

SI OTRA PERSONA AYUDÓ AL VOTANTE A MARCAR O DEVOLVER LA BOLETA, COMPLETE LO SIGUIENTE: Declaro bajo pena de perjurio: A petición del votante inscrito, ayudé a el votante identificado en esta declaración jurada a marcar o devolver la boleta del votante, yo marqué o devolví la boleta de acuerdo a lo que el votante me indicó directamente, proporcioné ayuda porque el votante físicamente no pudo marcar la boleta debido únicamente a enfermedad, lesión o limitación física o porque no podía devolver la boleta y entiendo que no hay ningún poder notarial para votar y que el votante debe hacer su selección aunque físicamente no pueda marcar la boleta.

Name of Voter Assistant:

Nombre del Asistente del Votante:

Address of Voter Assistant:

Dirección del Asistente del Votante:

BOD CODE:

SIGNATURE REQUIRED/FIRMA REQUERIDA

MARICOPA COUNTY  
NOV 3 2020 GENERAL ELECTION

Name of Voter

Signature

(SIGNATURE REQUIRED / FIRMA REQUERIDA)

(PHONE: if signature is questioned)  
(TELÉFONO: si la firma es cuestionada)

(DATE /  
FECHA)

BALLOT WILL NOT BE COUNTED WITHOUT YOUR SIGNATURE. POWERS OF ATTORNEY are not valid for voting purposes.  
LA BOLETA NO SE TRAMITAR SIN SU FIRMA. PODER DE ABOGADO no es válido para fines de votación.

different EVB return envelope formats

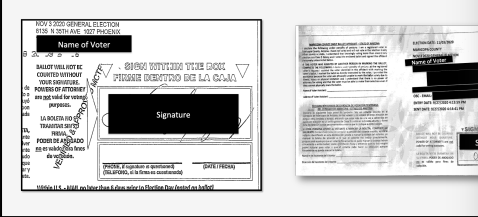
Large Print Image File, (LIF)



# Systems Process for Early Voting Ballot (EVB) Return Envelope Processing

Voter Submits EVB

EVB Return Envelope



Signature

10-21-2020

VERIFIED & APPROVED MCTEC  
sfp

6

MARICOPA COUNTY  
NOV 3 2020 GENERAL ELECTION  
10829 N 111TH AVE SUN CITY AZ 85351

Name of Voter

BOARD # 3

HAND DUP # 2456

100% OCT 29 2020

different EVB return envelope formats

Braille Image File, (BIF)

***Total Count of EVB Return Envelope Image Files Received by EchoMail: 1,929,240***  
***Breakdown by type of images***

Type of Image	Count	Percent
SIF	1,919,598	99.5%

***Total Count of EVB Return Envelope Image Files Received by EchoMail: 1,929,240***  
***Breakdown by type of images***

Type of Image	Count	Percent
SIF	1,919,598	99.5%
UIF-A	8,849	0.459%

***Total Count of EVB Return Envelope Image Files Received by EchoMail: 1,929,240***  
***Breakdown by type of images***

Type of Image	Count	Percent
SIF	1,919,598	99.5%
UIF-A	8,849	0.459%
UIF-B	277	0.014%

***Total Count of EVB Return Envelope Image Files Received by EchoMail: 1,929,240***  
***Breakdown by type of images***

Type of Image	Count	Percent
SIF	1,919,598	99.5%
UIF-A	8,849	0.459%
UIF-B	277	0.014%
UIF-C	12	0.001%

***Total Count of EVB Return Envelope Image Files Received by EchoMail: 1,929,240***  
*Breakdown by type of images*

Type of Image	Count	Percent
SIF	1,919,598	99.5%
UIF-A	8,849	0.459%
UIF-B	277	0.014%
UIF-C	12	0.001%
LIF	475	0.024%

***Total Count of EVB Return Envelope Image Files Received by EchoMail: 1,929,240***  
***Breakdown by type of images***

Type of Image	Count	Percent
SIF	1,919,598	99.5%
UIF-A	8,849	0.459%
UIF-B	277	0.014%
UIF-C	12	0.001%
LIF	475	0.024%
BIF	29	0.002%



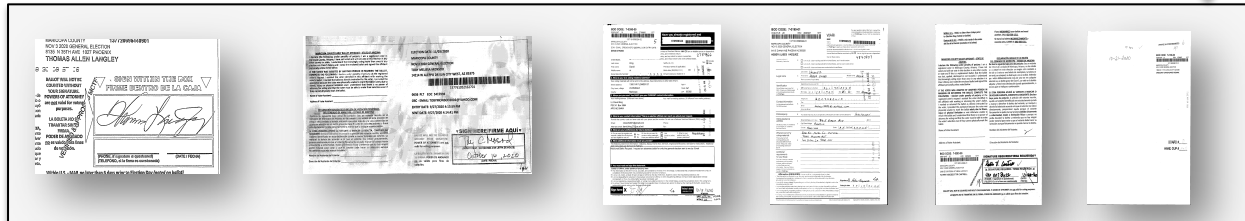
***Total Count of EVB Return Envelope Image Files Received by EchoMail: 1,929,240***

Type of Image	Count	Percent
SIF	1,919,598	99.5%
UIF-A	8,849	0.459%
UIF-B	277	0.014%
UIF-C	12	0.001%
LIF	475	0.024%
BIF	29	0.002%
<b>TOTAL</b>	<b>1,929,240</b>	<b>100%</b>

# *Systems Process for Early Voting Ballot Return Envelope Processing*

Voter Submits Early Voting Ballot (EVB)

EVB Return Envelopes Are Scanned into Images



Six (6) different EVB return envelope formats

***Removal of Duplicates***

## *Duplicates Analysis*

Type	Total Images	Duplicates	Unique Voters
2-Copy Duplicates	33,868	16,934	16,934

## *Duplicates Analysis*

Type	Total Images	Duplicates	Unique Voters
2-Copy Duplicates	33,868	16,934	16,934
3-Copy Duplicates	564	376	188

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Type	Total Images	Duplicates	Unique Voters
2-Copy Duplicates	33,868	16,934	16,934
3-Copy Duplicates	564	376	188
4-Copy Duplicates	<u>16</u>	<u>12</u>	<u>4</u>

## *Duplicates Analysis*

Type	Total Images	Duplicates	Unique Voters
2-Copy Duplicates	33,868	16,934	16,934
3-Copy Duplicates	564	376	188
4-Copy Duplicates	<u>16</u>	<u>12</u>	<u>4</u>
<b>Total</b>	<b>34,448</b>	<b>17,322</b>	<b>17,126</b>

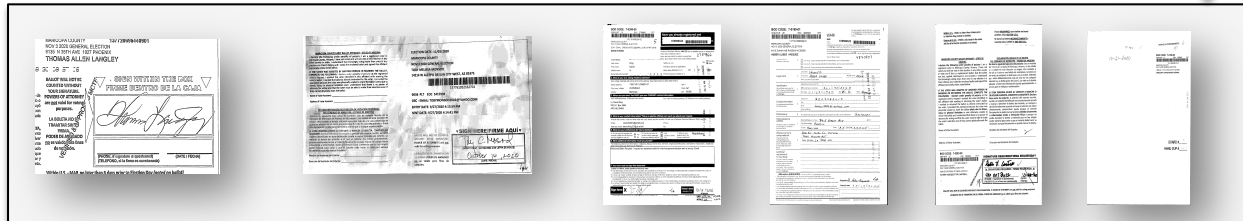
## *EchoMail: Total Unique EVB Return Envelopes*

	EchoMail Analysis
<b>EVB Return Envelopes Received</b>	<b>1,929,240</b>
<b>Duplicate Analysis</b>	
<b>Duplicates</b>	<u>(17,322)</u>
<b>Total Unique EVB Return Envelopes</b>	<b>1,911,918</b>

# *Systems Process for Early Voting Ballot Return Envelope Processing*

Voter Submits Early Voting Ballot (EVB)

EVB Return Envelopes Are Scanned into Images



Six (6) different EVB return envelope formats

***Removal of Duplicates***

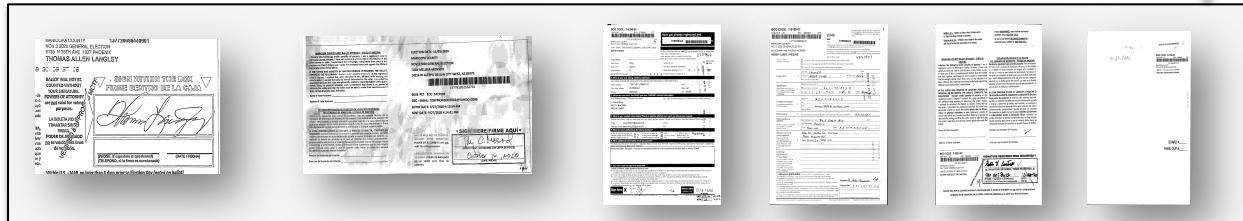
Signature Presence Detection



# *Systems Process for Early Voting Ballot Return Envelope Processing*

Voter Submits Early Voting Ballot (EVB)

EVB Return Envelopes Are Scanned into Images



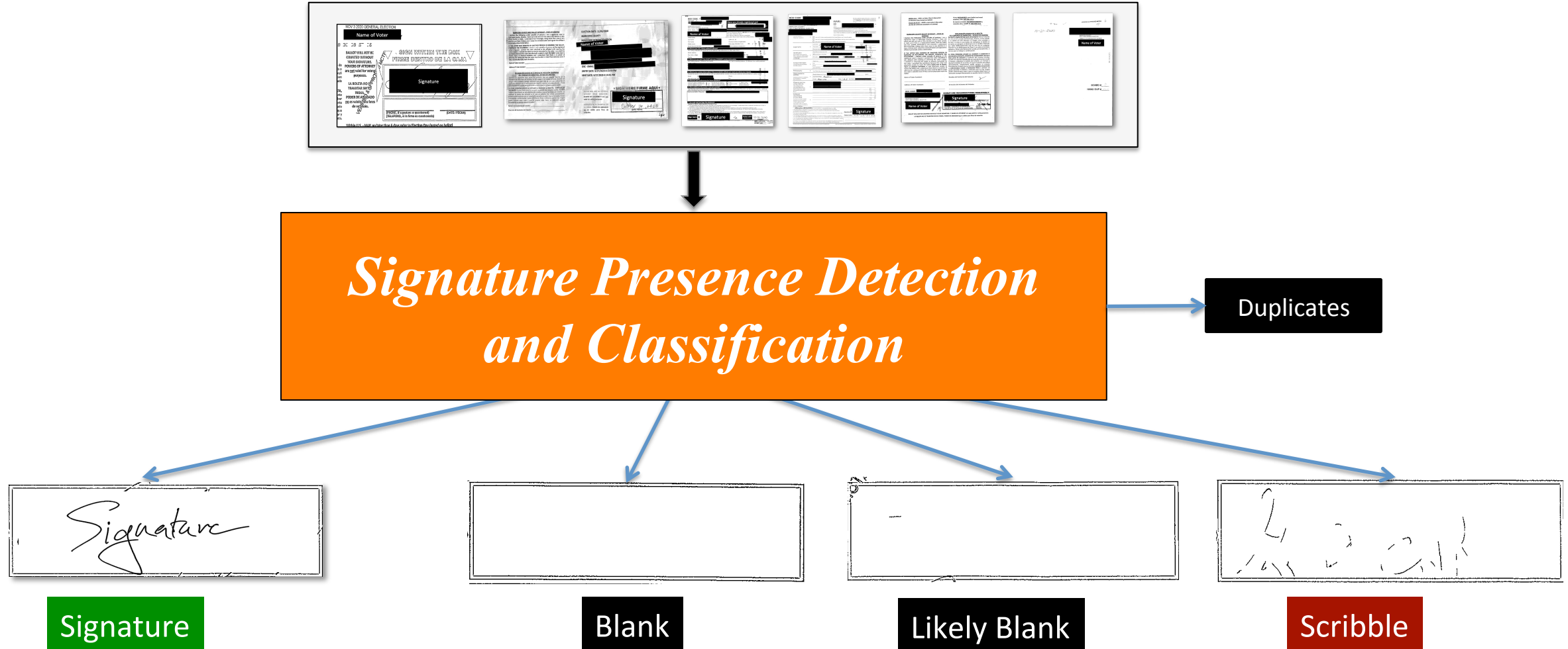
Six (6) different EVB return envelope formats

***Removal of Duplicates***

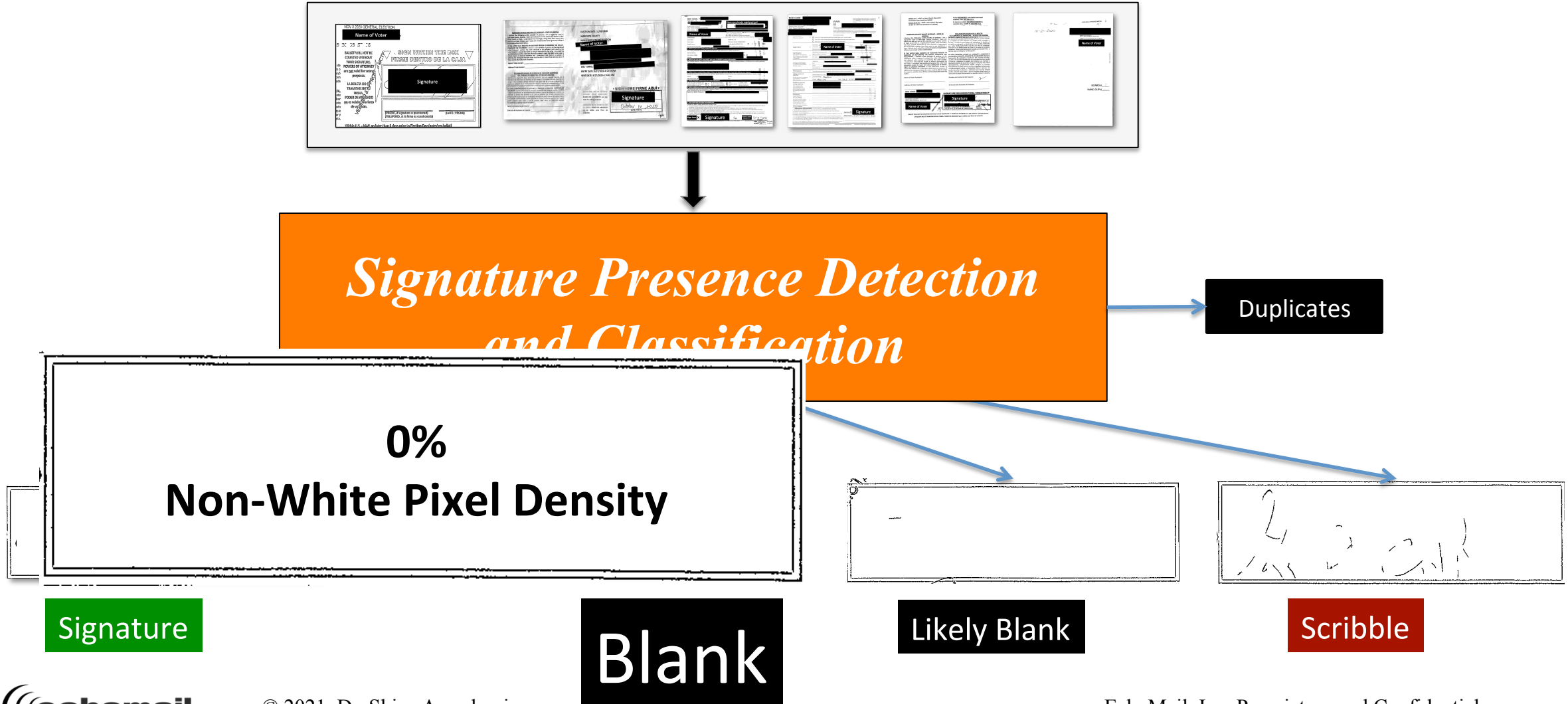
Signature Presence Detection

Determination of those EVBs **WITH** Signatures  
in the Signature Region of Return Envelope

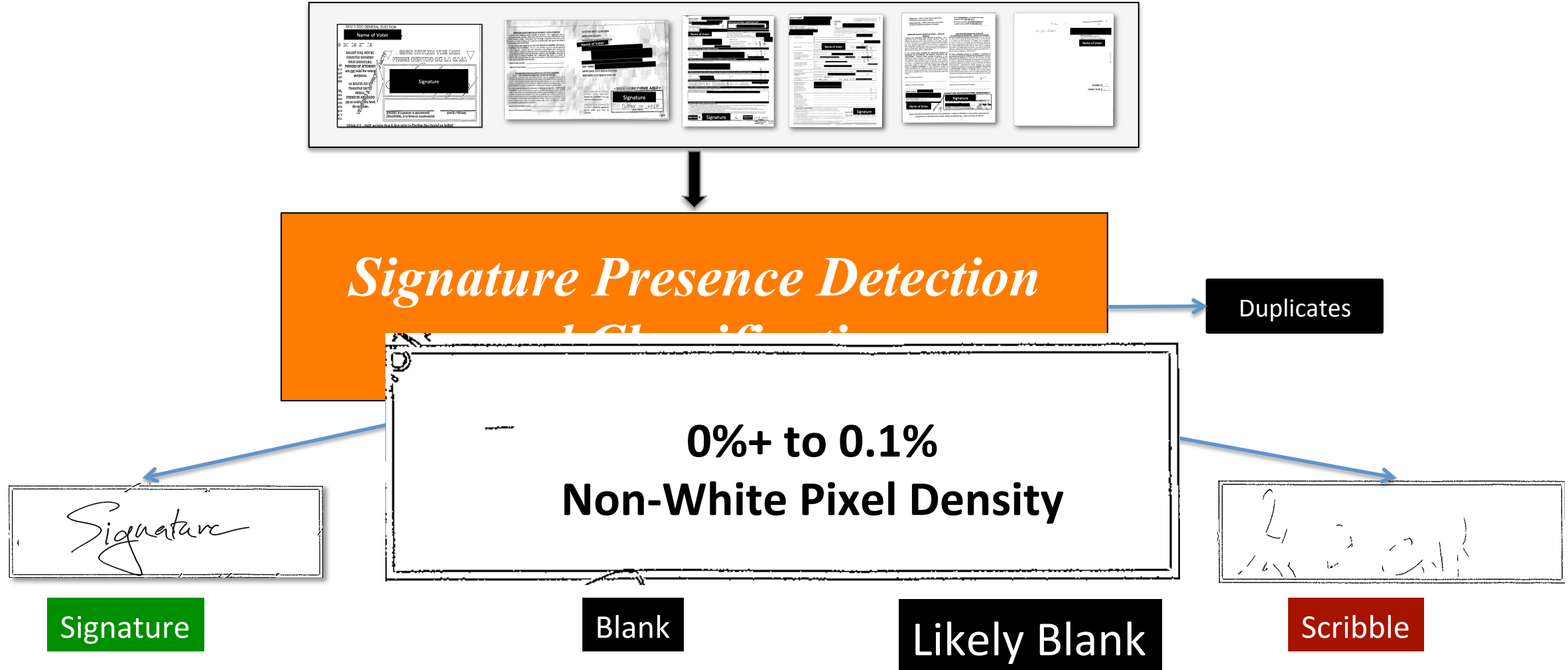
# *Pattern Recognition Classification of Signature Region on Early Voting Ballot (EVB) Return Envelope Images as Blank, Likely Blank, Scribble, or Signature*



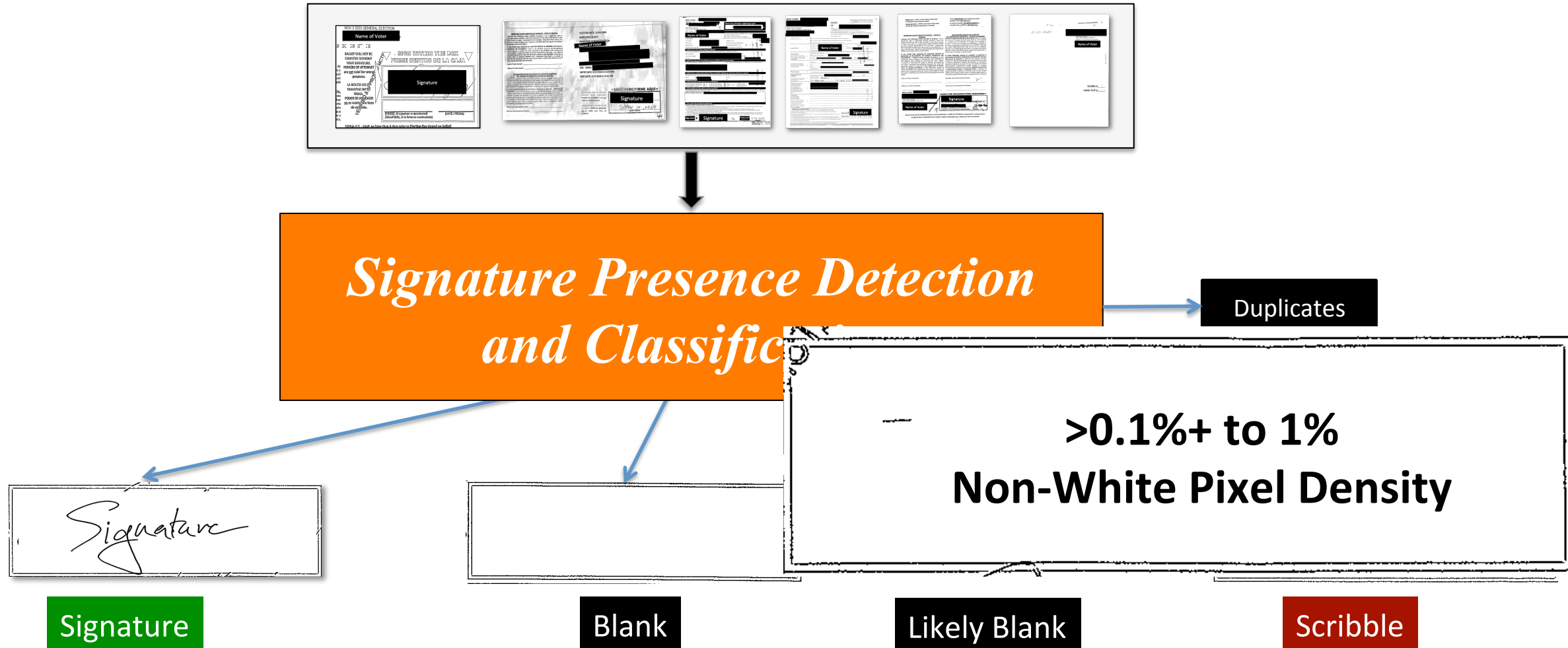
# *Pattern Recognition Classification of Signature Region on Early Voting Ballot (EVB) Return Envelope Images as Blank, Likely Blank, Scribble, or Signature*



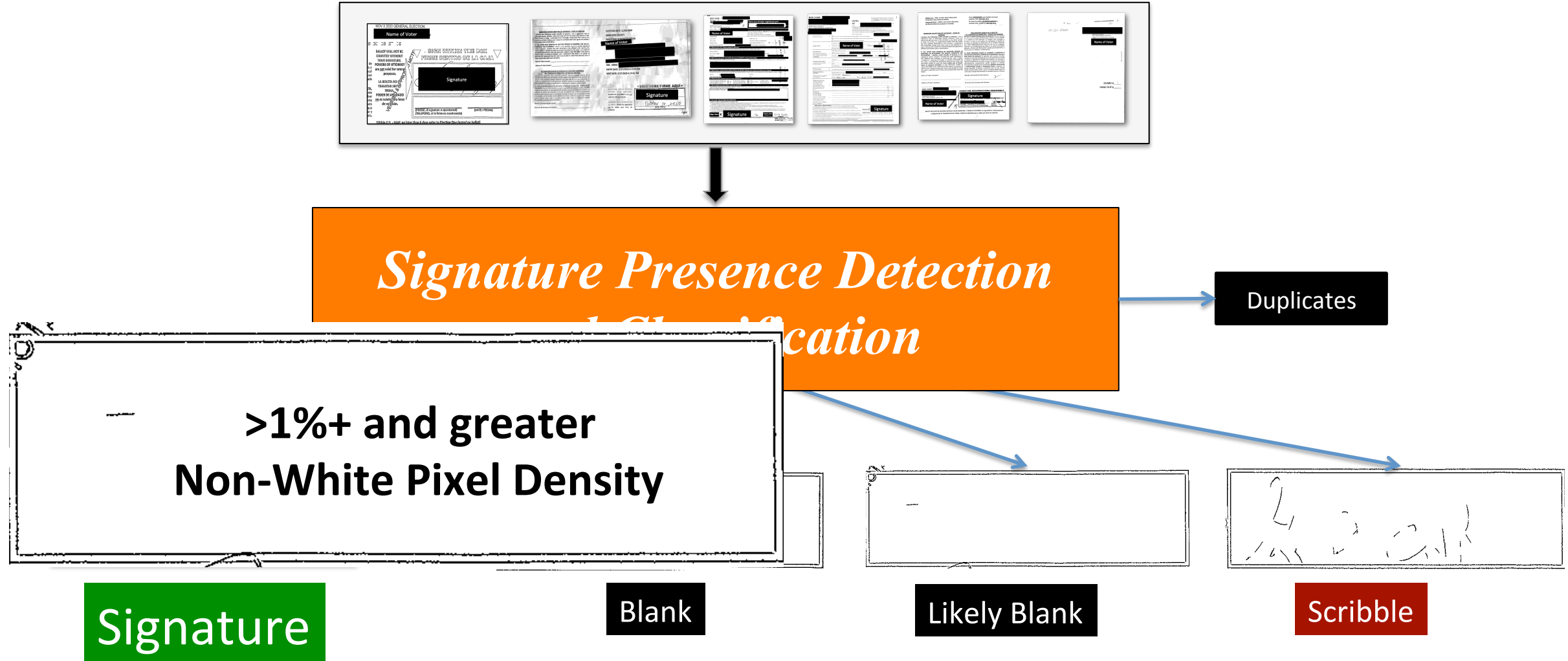
# *Pattern Recognition Classification of Signature Region on Early Voting Ballot (EVB) Return Envelope Images as Blank, Likely Blank, Scribble, or Signature*



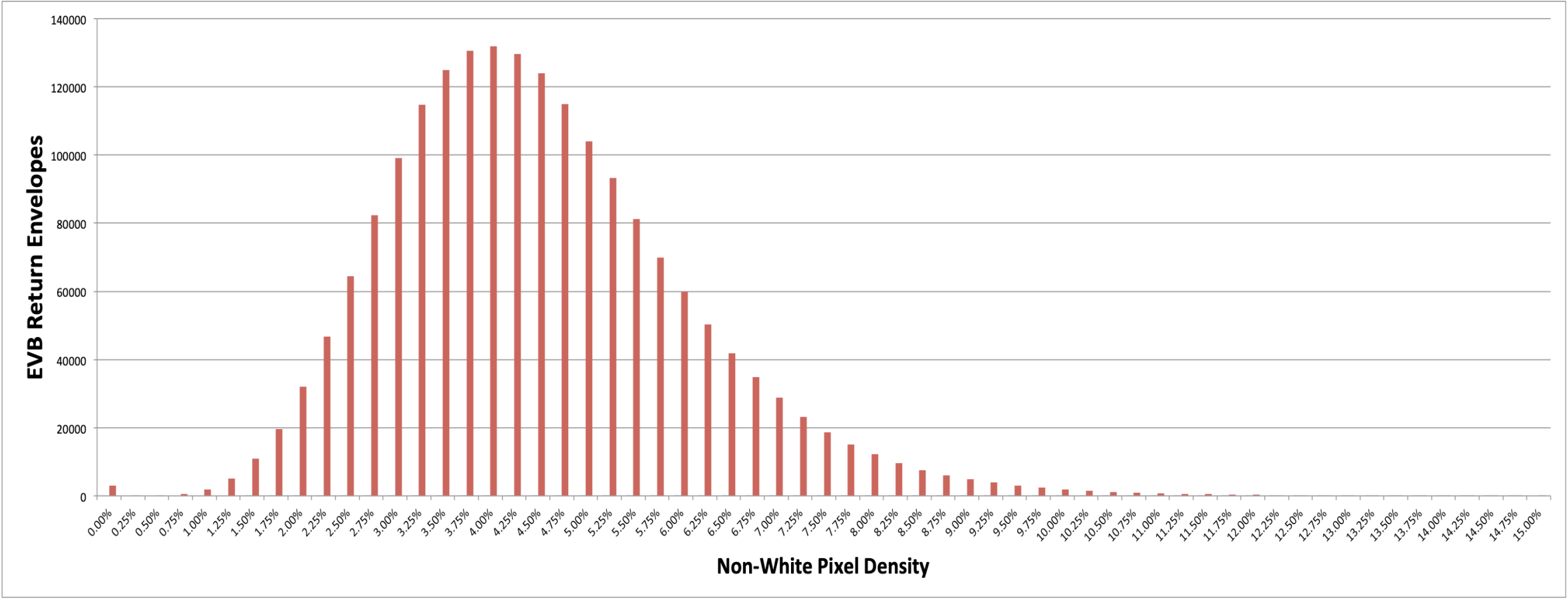
# *Pattern Recognition Classification of Signature Region on Early Voting Ballot (EVB) Return Envelope Images as Blank, Likely Blank, Scribble, or Signature*



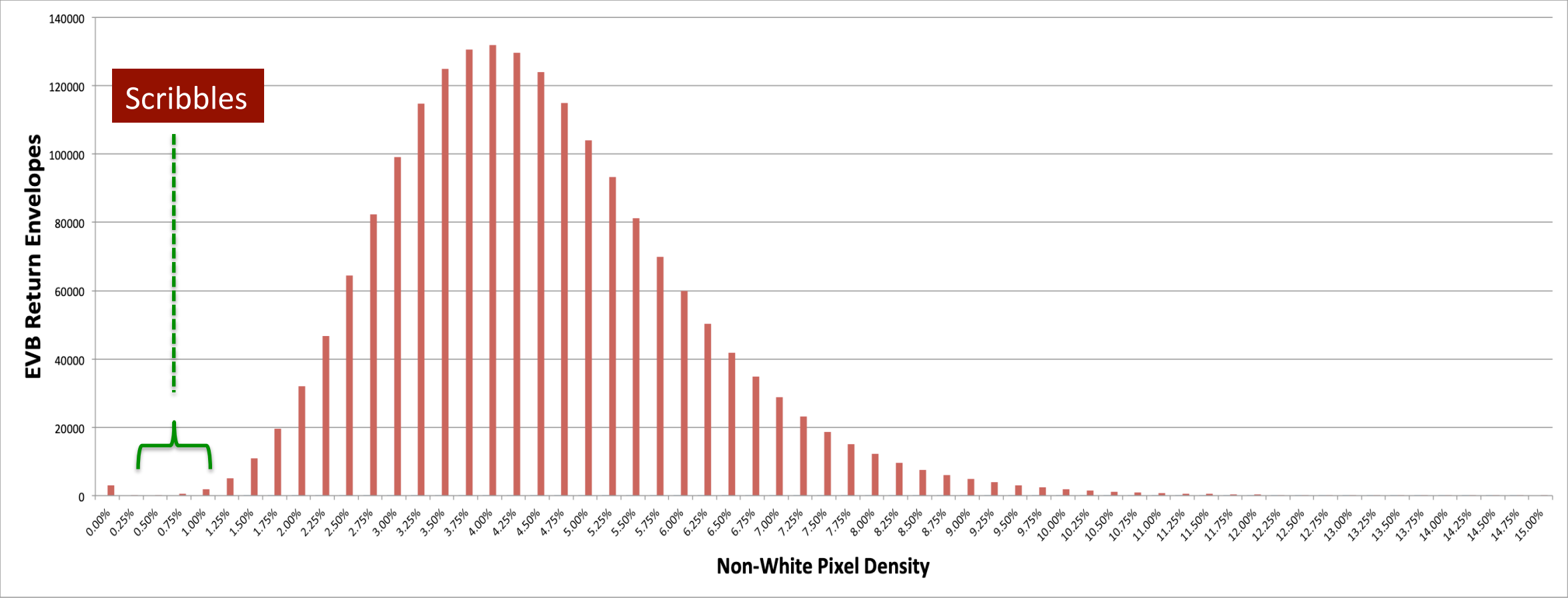
# *Pattern Recognition Classification of Signature Region on Early Voting Ballot (EVB) Return Envelope Images as Blank, Likely Blank, Scribble, or Signature*



# *%Non-White Pixel Density vs. EVB Return Envelope Volume*

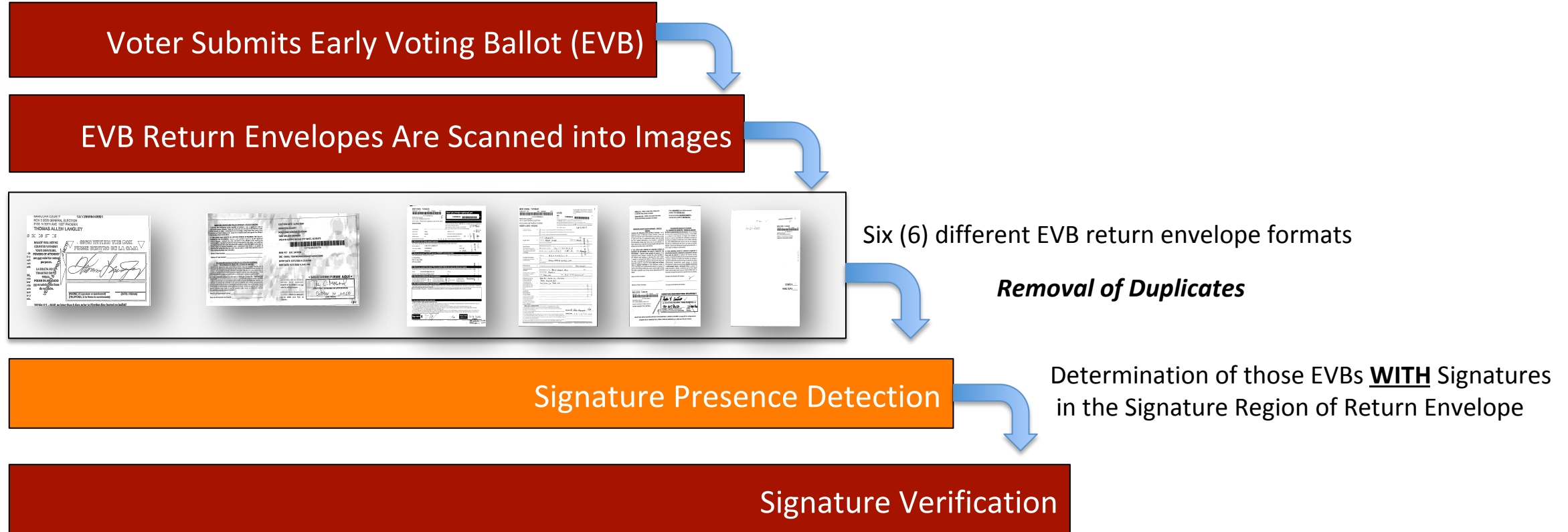


# *%Non-White Pixel Density vs. EVB Return Envelope Volume*

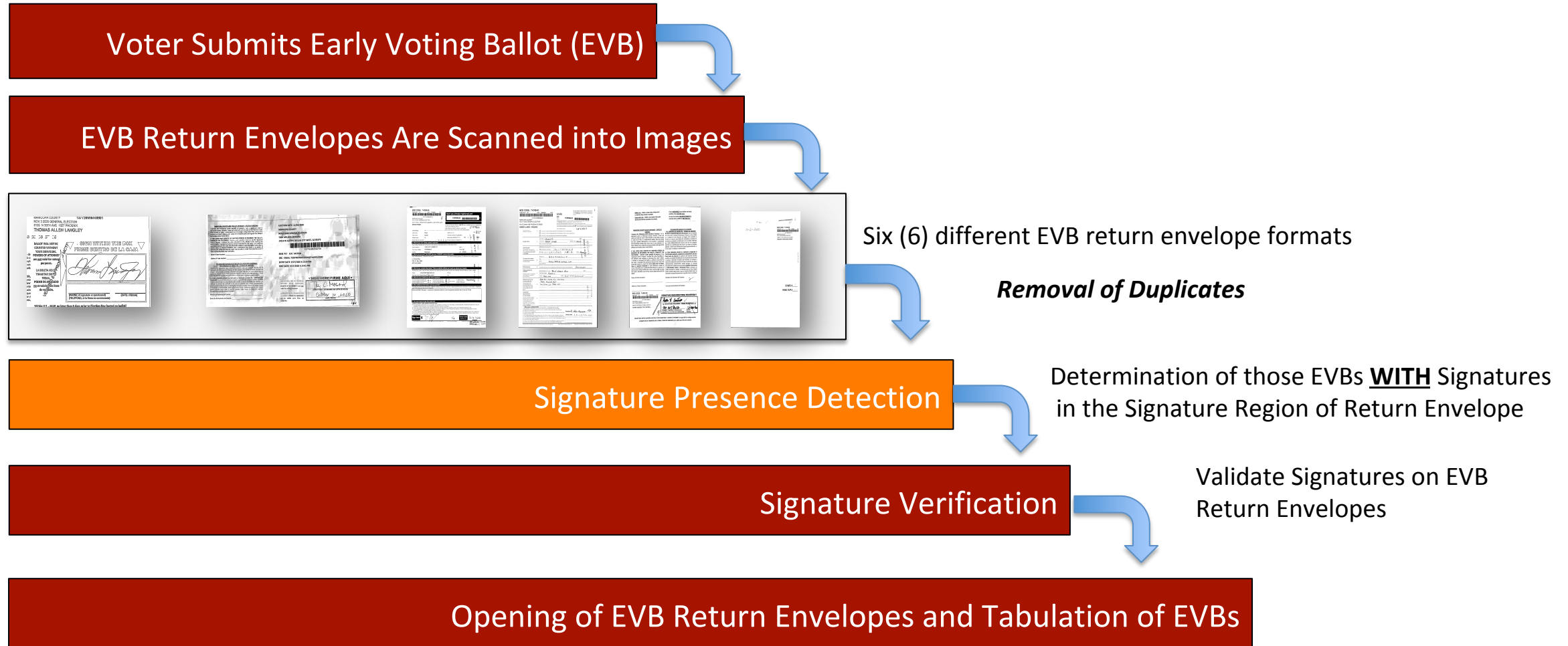




# Systems Process for Early Voting Ballot Return Envelope Processing



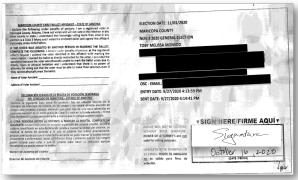
# Systems Process for Early Voting Ballot Return Envelope Processing



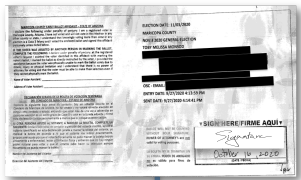
## *Signature Presence Detection*



# EVB Return Envelope Image



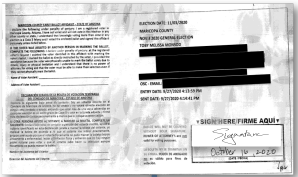
EVB Return  
Envelope Image



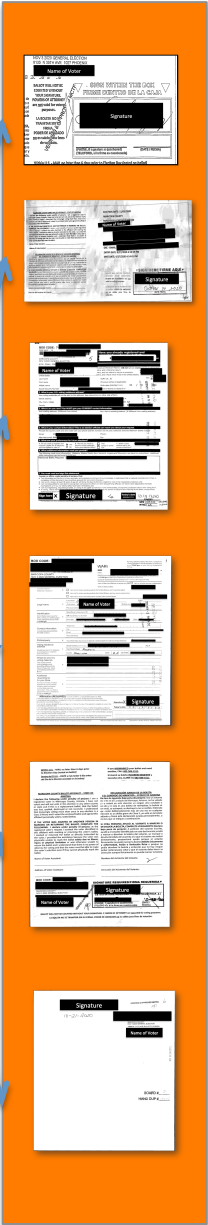
Automatic  
EVB Envelope  
Classification



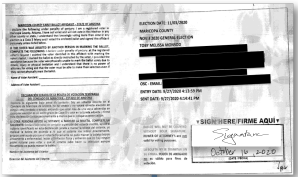
EVB Return  
Envelope Image



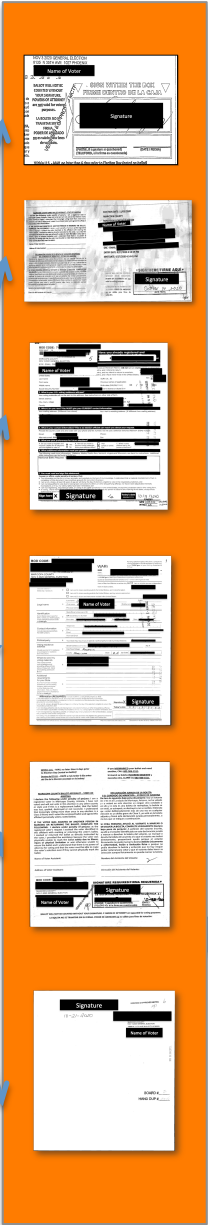
Automatic  
EVB Envelope  
Classification



EVB Return  
Envelope Image



Automatic  
EVB Envelope  
Classification

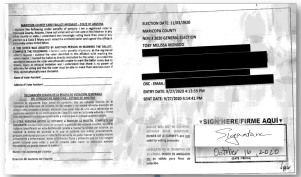


Duplicate  
Recognition

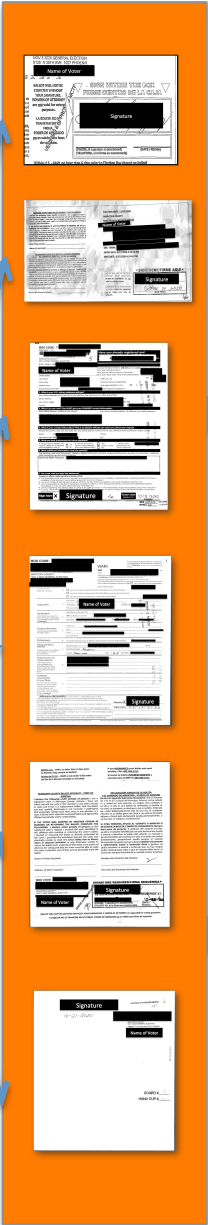
Duplicates



EVB Return  
Envelope Image



Automatic  
EVB Envelope  
Classification



Detection  
of  
Signature  
Region  
&  
OCR of  
Name

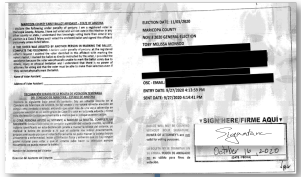
Duplicate  
Recognition

Duplicates

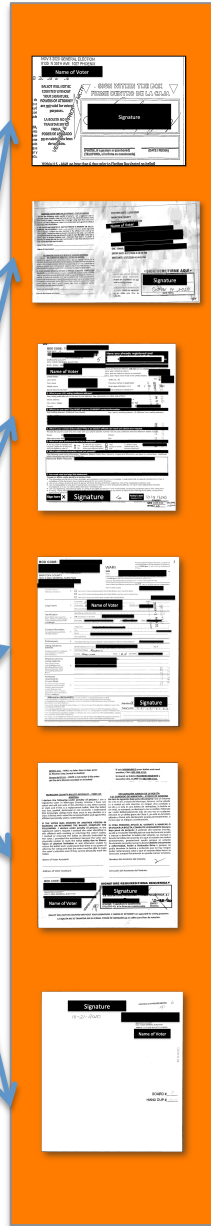




EVB Return  
Envelope Image



Automatic  
EVB Envelope  
Classification



Detection  
of  
Signature  
Region  
&  
OCR of  
Name

Duplicate  
Recognition

Duplicates

Pattern Recognition Classification of  
Signature Region

EchoMail SIF  
Classifier

EchoMail UIF-A  
Classifier

EchoMail UIF-B  
Classifier

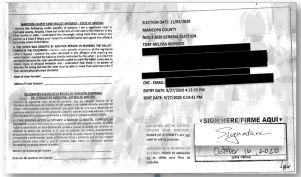
EchoMail MIF-C  
Classifier

EchoMail LIF  
Classifier

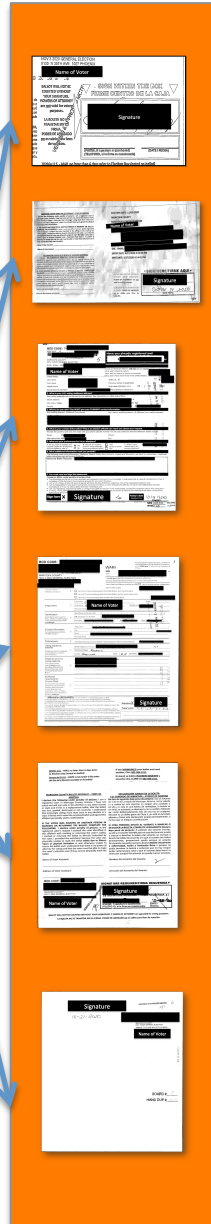
EchoMail BIF  
Classifier



EVB Return  
Envelope Image



Automatic  
EVB Envelope  
Classification



Detection  
of  
Signature  
Region  
&  
OCR of  
Name

Duplicate  
Recognition

Duplicates

Pattern Recognition Classification of  
Signature Region

EchoMail SIF  
Classifier

EchoMail UIF-A  
Classifier

EchoMail UIF-B  
Classifier

EchoMail MIF-C  
Classifier

EchoMail LIF  
Classifier

EchoMail BIF  
Classifier

Signature

*Signature*

Blank

Likely Blank

Scribble



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EchoMail, Inc. Proprietary and Confidential.

## *Non-Duplicate Signature Presence Detection Results*

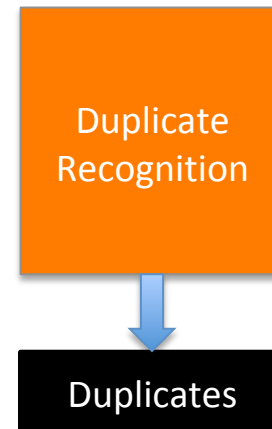
<b>Classification of Non-Duplicate EVB Return Envelope Images</b>	<b>Count</b>	<b>Percentage</b>
Signature	1,890,500	99.77%
Scribble	2,420	0.13%
Blank	1,771	0.09%
Likely Blank	101	0.01%
<b>TOTAL</b>	<b>1,894,792</b>	<b>100.00%</b>

## *Non-Duplicate Signature Presence Detection Results*

- Scribbles
  - **2,420 Scribbles**
- Blanks i.e. “No Signatures”
  - **1,771**
  - **101**
  - **1,872 Blanks**

Non-Duplicate Image Classification	Count
Signature	1,890,500
Scribble	2,420
Blank	1,771
Likely Blank	101
<b>TOTAL</b>	<b>1,894,792</b>

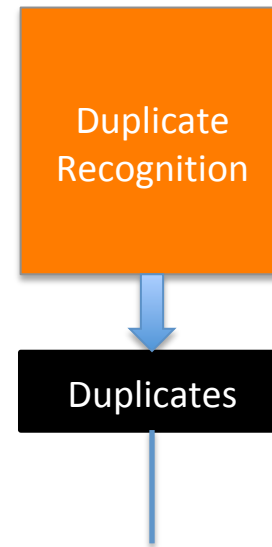
# *EchoMail Pattern Recognition Methodology & Process for 2-Copy Duplicate Classification*



## LEGEND

■	Signature/Signature	(SS)
■	Signature/Blank	(SB)
■	Signature/Likely Blank	(SL)
■	Signature/Scribble	(SC)
■	Scribble/Blank	(CB)
■	Scribble/Likely Blank	(CL)
■	Scribble/Scribble	(CC)
■	Blank/Blank	(BB)
■	Blank/Likely Blank	(BL)
■	Likely Blank/Likely Blank	(LL)

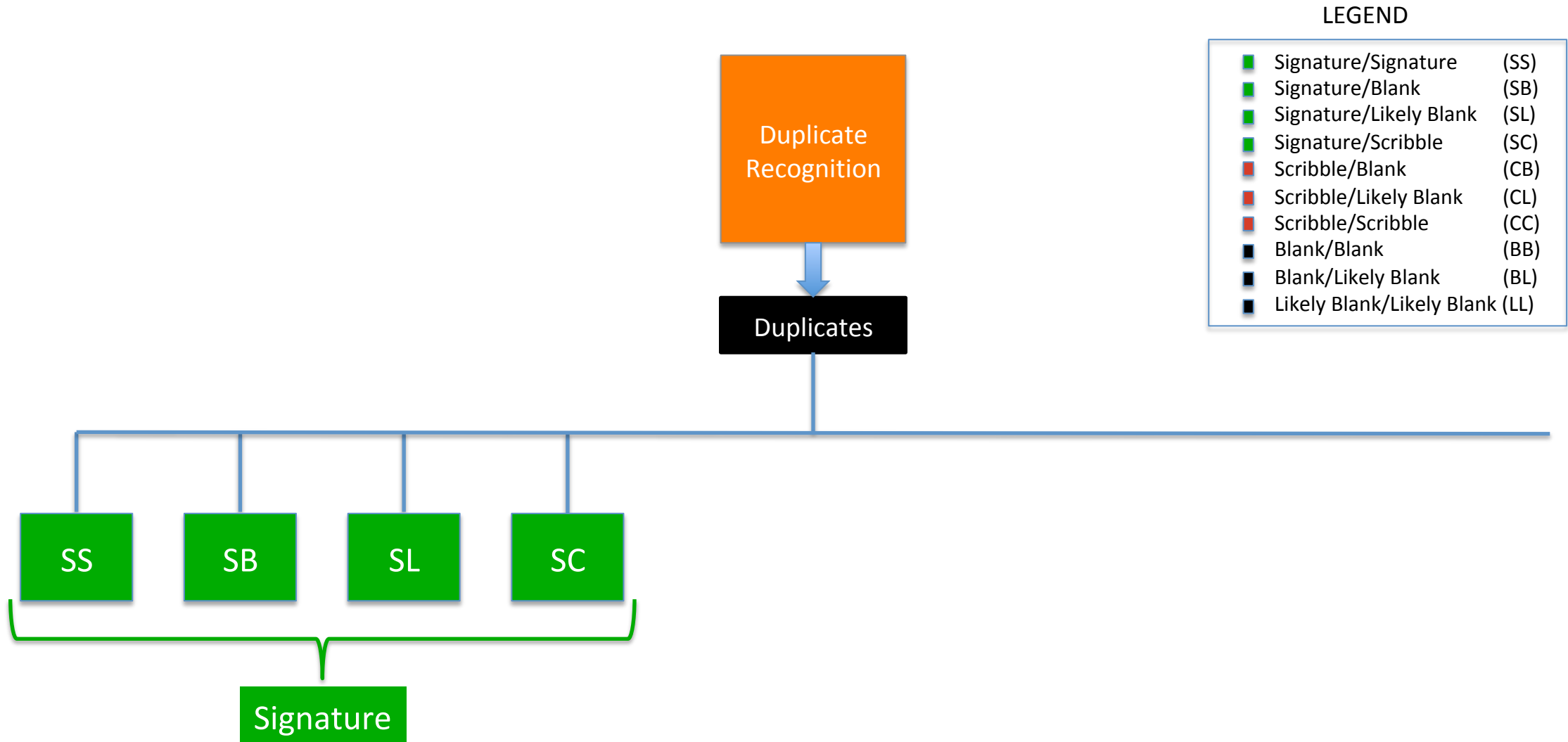
# *EchoMail Pattern Recognition Methodology & Process for 2-Copy Duplicate Classification*



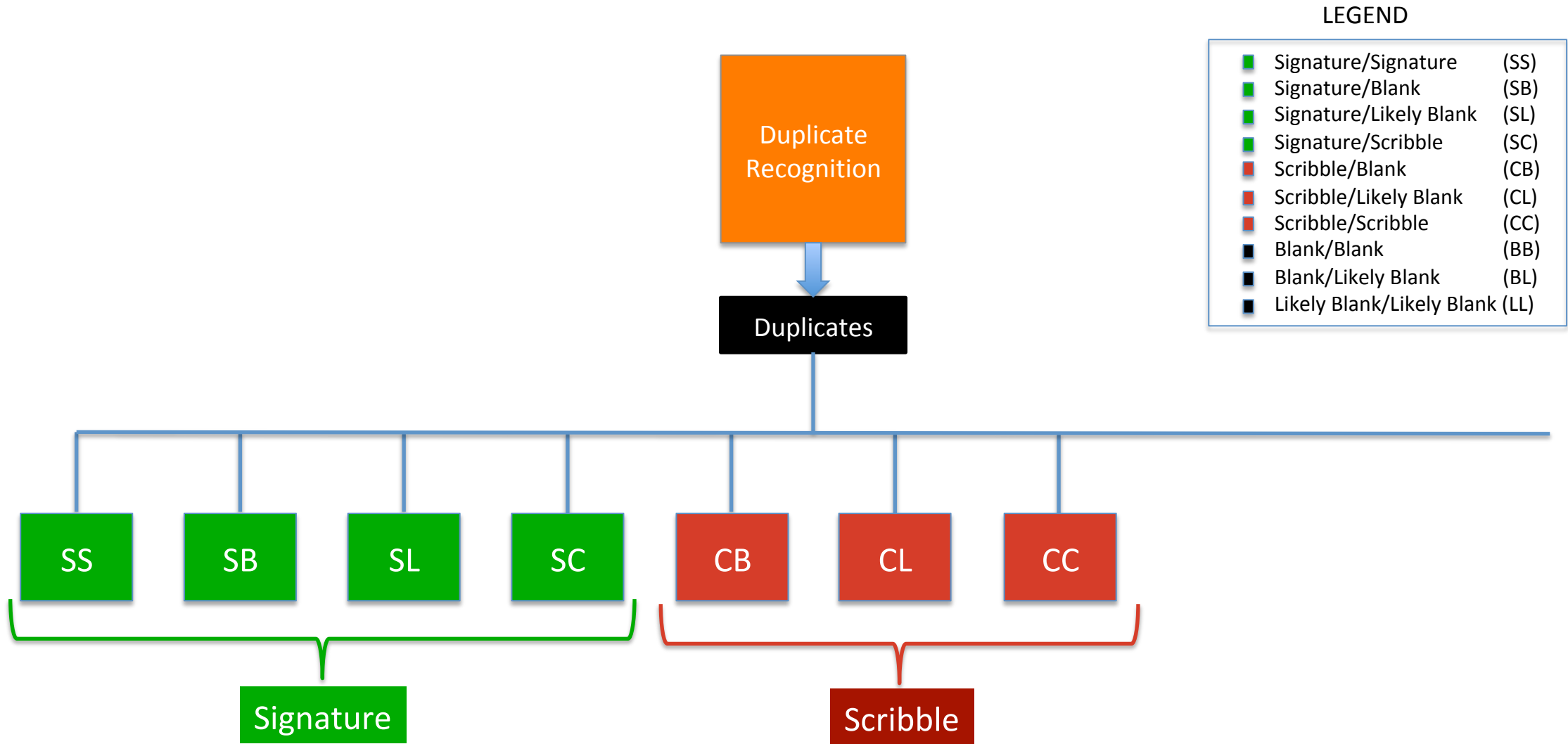
## LEGEND

■	Signature/Signature	(SS)
■	Signature/Blank	(SB)
■	Signature/Likely Blank	(SL)
■	Signature/Scribble	(SC)
■	Scribble/Blank	(CB)
■	Scribble/Likely Blank	(CL)
■	Scribble/Scribble	(CC)
■	Blank/Blank	(BB)
■	Blank/Likely Blank	(BL)
■	Likely Blank/Likely Blank	(LL)

# *EchoMail Pattern Recognition Methodology & Process for 2-Copy Duplicate Classification*

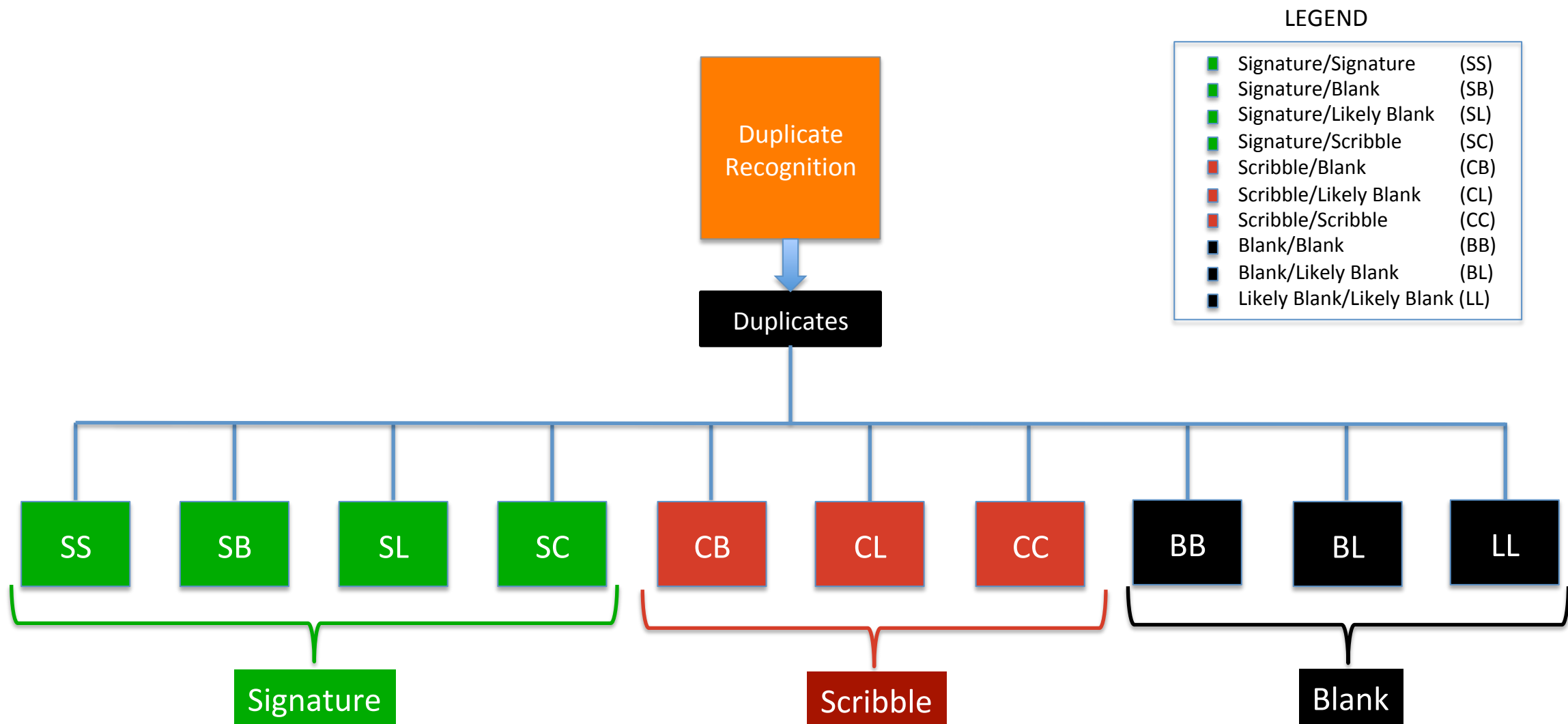


# EchoMail Pattern Recognition Methodology & Process for 2-Copy Duplicate Classification





# EchoMail Pattern Recognition Methodology & Process for 2-Copy Duplicate Classification



# Duplicate (Signed & Signed - SS)

NOV 3 2020 GENERAL ELECTION  
11000 N. 40TH AVE, 1001 GLENDALE, AZ 80245

**Name of Voter**

BALLOT WILL NOT BE COUNTED WITHOUT YOUR SIGNATURE.  
POWERS OF ATTORNEY are not valid for voting purposes.  
LA BOLETA NO SE TRAMITAR SIN SU FIRMA.  
PODER DE ABOGADO no es valido para fines de votación.

SIGN WITHIN THE BOX  
FIRME DENTRO DE LA CAJA

**Signature**

**Phone Number** 10/13/2020  
(PHONE, if signature is questioned) (DATE/FECHA)  
(TELÉFONO, si la firma es cuestionada)

Within U.S. - MAIL no later than 6 days prior to Election Day (noted on ballot)

NOV 3 2020 GENERAL ELECTION  
11000 N. 40TH AVE, 1001 GLENDALE, AZ 80245

**Name of Voter**

BALLOT WILL NOT BE COUNTED WITHOUT YOUR SIGNATURE.  
POWERS OF ATTORNEY are not valid for voting purposes.  
LA BOLETA NO SE TRAMITAR SIN SU FIRMA.  
PODER DE ABOGADO no es valido para fines de votación.

SIGN WITHIN THE BOX  
FIRME DENTRO DE LA CAJA

**Signature**

**Phone Number** 10/13/2020  
(PHONE, if signature is questioned) (DATE/FECHA)  
(TELÉFONO, si la firma es cuestionada)

Within U.S. - MAIL no later than 6 days prior to Election Day (noted on ballot)

# Duplicate (Signed & Blank - SB)

NOV 3 2020 GENERAL ELECTION

Name of Voter

BALLOT WILL NOT BE COUNTED WITHOUT YOUR SIGNATURE.  
POWERS OF ATTORNEY are not valid for voting purposes.

LA BOLETA NO SE TRAMITAR SIN SU FIRMA.  
PODER DE ABOGADO no es válido para fines de votación.

SIGN WITHIN THE BOX  
FIRME DENTRO DE LA CAJA

Signature

Phone Number

(PHONE, if signature is questioned)  
(TELEFONO, si la firma es cuestionada)

01/07/2020  
(DATE / FECHA)

Within U.S. - MAIL no later than 6 days prior to Election Day (noted on ballot)

NOV 3 2020 GENERAL ELECTION

Name of Voter

BALLOT WILL NOT BE COUNTED WITHOUT YOUR SIGNATURE.  
POWERS OF ATTORNEY are not valid for voting purposes.

LA BOLETA NO SE TRAMITAR SIN SU FIRMA.  
PODER DE ABOGADO no es válido para fines de votación.

SIGN WITHIN THE BOX  
FIRME DENTRO DE LA CAJA

(PHONE, if signature is questioned)  
(TELEFONO, si la firma es cuestionada)

(DATE / FECHA)

Within U.S. - MAIL no later than 6 days prior to Election Day (noted on ballot)

# Duplicate (Signed & Likely Blank - SL)

NOV 3 2020 GENERAL ELECTION

Name of Voter

BALLOT WILL NOT BE COUNTED WITH YOUR SIGNATURE IF POWERS OF ATTORNEY are not valid for purposes.

LA BOLETA NO PODRÁ SER TRAMITADA SIN FIRMA.

PODER DE ABOGADO no es válido para fines de votación.

SIGN WITHIN THE BOX  
FIRME DENTRO DE LA CAJA

Signature

Phone Number

OCT 12 2020  
(DATE / FECHA)

Within U.S. - MAIL no later than 6 days prior to Election Day (noted on ballot)

NOV 3 2020 GENERAL ELECTION

Name of Voter

BALLOT WILL NOT BE COUNTED WITH YOUR SIGNATURE IF POWERS OF ATTORNEY are not valid for purposes.

LA BOLETA NO PODRÁ SER TRAMITADA SIN FIRMA.

PODER DE ABOGADO no es válido para fines de votación.

Within U.S. - MAIL

# Duplicate (Signed & Scribble - SC)

NOV 3 2020 GENERAL ELECTION  
20110 WIDENBERG, WILLIAM DE WITTMANN

**Name of Voter**

NOV 3 2020

BALLOT WILL NOT BE COUNTED WITHOUT YOUR SIGNATURE.  
POWERS OF ATTORNEY are not valid for voting purposes.

LA BOLETA NO SE TRAMITAR SIN SU FIRMA.  
PODER DE ABOGADO no es válido para fines de votación.

**Signature**

**Phone Number**

(PHONE, if signature is questioned)  
(TELÉFONO, si la firma es cuestionada)

10/21/20 (DATE / FECHA)

Within U.S. - MAIL no later than 6 days prior to Election Day (noted on ballot)

NOV 3 2020 GENERAL ELECTION

**Name of Voter**

BALLOT WILL NOT BE COUNTED WITHOUT YOUR SIGNATURE.  
POWERS OF ATTORNEY are not valid for voting purposes.

LA BOLETA NO SE TRAMITAR SIN SU FIRMA.  
PODER DE ABOGADO no es válido para fines de votación.

**Signature**

(PHONE, if signature is questioned)  
(TELÉFONO, si la firma es cuestionada)

(DATE / FECHA)

Within U.S. - MAIL no later than 6 days prior to Election Day (noted on ballot)

# *Duplicate (Scribble & Blank - CB)*

## *Signature Region with Blank is Being Approved*

NOV 3 2020 GENERAL ELECTION

Name of Voter

BALLOT WILL NOT BE COUNTED WITHOUT YOUR SIGNATURE.  
POWERS OF ATTORNEY are not valid for voting purposes.  
LA BOLETA NO SE TRAMITAR SIN SU FIRMA.  
PODER DE ABOGADO no es válido para fines de votación.

SIGN WITHIN THE BOX  
FIRME DENTRO DE LA CAJA

Phone Number

10-20-2020

(PHONE, if signature is questioned)  
(TELÉFONO, si la firma es cuestionada)

Within U.S. - MAIL no later than 6 days prior to Election Day (noted on ballot)

NOV 3 2020 GENERAL ELECTION

Name of Voter

BALLOT WILL NOT BE COUNTED WITHOUT YOUR SIGNATURE.  
POWERS OF ATTORNEY are not valid for voting purposes.  
LA BOLETA NO SE TRAMITAR SIN SU FIRMA.  
PODER DE ABOGADO no es válido para fines de votación.

SIGN WITHIN THE BOX  
FIRME DENTRO DE LA CAJA

Phone Number

10-20-2020

(PHONE, if signature is questioned)  
(TELÉFONO, si la firma es cuestionada)

Within U.S. - MAIL no later than 6 days prior to Election Day (noted on ballot)

# *Duplicate (Scribble & Likely Blank - CL)*

## *Signature Region with Scribble is Being Approved*



NOV 3 2020 GENERAL ELECTION

**Name of Voter**

BALLOT WILL NOT BE COUNTED WITHOUT YOUR SIGNATURE.  
POWERS OF ATTORNEY are not valid for voting purposes.

LA BOLETA NO SE TRAMITAR SIN FIRMA.  
PODER DE ABOGADO no es válido para fines de votación.

**SIGN WITHIN THE BOX**  
**FIRME DENTRO DE LA CAJA**

**VERIFIED**

(PHONE, if signature is questioned) (DATE / FECHA)  
(TELEFONO, si la firma es cuestionada)

Within U.S. - MAIL no later than 6 days prior to Election Day (noted on ballot)

NOV 3 2020 GENERAL ELECTION

**Name of Voter**

BALLOT WILL NOT BE COUNTED WITHOUT YOUR SIGNATURE.  
POWERS OF ATTORNEY are not valid for voting purposes.

LA BOLETA NO SE TRAMITAR SIN SU FIRMA.  
PODER DE ABOGADO no es válido para fines de votación.

**SIGN WITHIN THE BOX**  
**FIRME DENTRO DE LA CAJA**

(PHONE, if signature is questioned) (DATE / FECHA)  
(TELEFONO, si la firma es cuestionada)

Within U.S. - MAIL no later than 6 days prior to Election Day (noted on ballot)

# Duplicate (Scribble & Scribble - CC)

NOV 3 2020 GENERAL ELECTION

Name of Voter

BALLOT WILL NOT BE COUNTED WITHOUT YOUR SIGNATURE.  
POWERS OF ATTORNEY are not valid for voting purposes.  
LA BOLTA NO SE TRAMITAR SIN SU FIRMA.  
PODER DE ABOGADO no es válido para fines de votación.

SIGN WITHIN THE BOX  
FIRME DENTRO DE LA CAJA

Phone Number 10 12.20  
(TELÉFONO, si la firma es cuestionada)  
(DATE / FECHA)

Within U.S. - MAIL no later than 6 days prior to Election Day (noted on ballot)

NOV 3 2020 GENERAL ELECTION

Name of Voter

BALLOT WILL NOT BE COUNTED WITHOUT YOUR SIGNATURE.  
POWERS OF ATTORNEY are not valid for voting purposes.  
LA BOLTA NO SE TRAMITAR SIN SU FIRMA.  
PODER DE ABOGADO no es válido para fines de votación.

SIGN WITHIN THE BOX  
FIRME DENTRO DE LA CAJA

Phone Number 10 12.20  
(TELÉFONO, si la firma es cuestionada)  
(DATE / FECHA)

Within U.S. - MAIL no later than 6 days prior to Election Day (noted on ballot)



# *Duplicate (Blank & Blank - BB)*

## *Signature Region with Blank is Being Approved*

NOV 3 2020 GENERAL ELECTION

**Name of Voter**

BALLOT WILL NOT BE COUNTED WITHOUT YOUR SIGNATURE

POWERS OF ATTORNEY are not valid for voting purposes.

LA BOLETA NO SE TRAMITAR SIN SU FIRMA.

PODER DE ABOGADO no es valido para fines de votacion.

**SIGN WITHIN THE BOX**  
**FIRME DENTRO DE LA CAJA**

(PHONE, if signature is questioned)  
(TELEFONO, si la firma es cuestionada)

(DATE / FECHA)

Within U.S. - MAIL no later than 6 days prior to Election Day (noted on ballot)

NOV 3 2020 GENERAL ELECTION

**Name of Voter**

BALLOT WILL NOT BE COUNTED WITHOUT YOUR SIGNATURE

POWERS OF ATTORNEY are not valid for voting purposes.

LA BOLETA NO SE TRAMITAR SIN SU FIRMA.

PODER DE ABOGADO no es valido para fines de votacion.

**SIGN WITHIN THE BOX**  
**FIRME DENTRO DE LA CAJA**

(PHONE, if signature is questioned)  
(TELEFONO, si la firma es cuestionada)

(DATE / FECHA)

Within U.S. - MAIL no later than 6 days prior to Election Day (noted on ballot)

VERIFIED & APPROVED MCTEC

# *Duplicate (Blank & Likely Blank - BL) Signature Region with Likely Blank is Being Approved*

NOV 3 2020 GENERAL ELECTION

Name of Voter

BALLOT WILL NOT BE COUNTED WITHOUT YOUR SIGNATURE.

POWERS OF ATTORNEY are not valid for voting purposes.

LA BOLETA NO SE TRAMITAR SIN SU FIRMA.

PODER DE ABOGADO no es válido para fines de votación.

SIGN WITHIN THE BOX  
FIRME DENTRO DE LA CAJA

Phone Number

10/13/2020  
(DATE / FECHA)

(PHONE, if signature is questioned)  
(TELÉFONO, si la firma es cuestionada)

NOV 3 2020 GENERAL ELECTION

Name of Voter

BALLOT WILL NOT BE COUNTED WITHOUT YOUR SIGNATURE.

POWERS OF ATTORNEY are not valid for voting purposes.

LA BOLETA NO SE TRAMITAR SIN SU FIRMA.

PODER DE ABOGADO no es válido para fines de votación.

SIGN WITHIN THE BOX  
FIRME DENTRO DE LA CAJA

Phone Number

10/13/2020  
(DATE / FECHA)

(PHONE, if signature is questioned)  
(TELÉFONO, si la firma es cuestionada)

\*Orientation of Name of Voter varies between the two duplicates, thought the exact same image. Appears as if name was overlaid differently from one image to another.

# *Duplicate (Likely Blank & Likely Blank - LL) Signature Region with Likely Blank is Being Approved*

NOV 3 2020 GENERAL ELECTION

Name of Voter

BALLOT WILL NOT BE COUNTED WITHOUT YOUR SIGNATURE  
POWERS OF ATTORNEY are not valid for voting purposes.  
LA BOLETA NO SE TRAMITAR SIN SU FIRMA  
PODER DE ABOGADO no es válido para fines de votación.

SIGN WITHIN THE BOX  
FIRME DENTRO DE LA CAJA

Phone Number 10-22-2020  
(TELEFONO, si la firma es cuestionada) (DATE / FECHA)

Within U.S. - MAIL no later than 6 days prior to Election Day (noted on ballot)

NOV 3 2020 GENERAL ELECTION

Name of Voter

BALLOT WILL NOT BE COUNTED WITHOUT YOUR SIGNATURE  
POWERS OF ATTORNEY are not valid for voting purposes.  
LA BOLETA NO SE TRAMITAR SIN SU FIRMA  
PODER DE ABOGADO no es válido para fines de votación.

SIGN WITHIN THE BOX  
FIRME DENTRO DE LA CAJA

Phone Number 10-22-2020  
(TELEFONO, si la firma es cuestionada) (DATE / FECHA)

Within U.S. - MAIL no later than 6 days prior to Election Day (noted on ballot)

## 2-Copy Duplicate Signature Presence Detection Results

Image Copy I	Image Copy II	Classification	Count	
Signature	Signature	SS	15,288	Signatures for Verification
Signature	Blank	SB	1,348	
Signature	Likely Blank	SL	26	
Signature	Scribble	SC	72	
Scribble	Blank	CB	6	Scribbles
Scribble	Likely Blank	CL	7	
Scribble	Scribble	CC	142	
Blank	Blank	BB	36	Blanks "No Signatures"
Blank	Likely Blank	BL	5	
Likely Blank	Likely Blank	LL	4	
		<b>TOTAL</b>	<b>16,934</b>	

## *2-Copy Duplicate Signature Presence Detection Results*

- Scribbles
  - **CB + CL + CC**
  - **6 + 7 + 142**
  - **155 Scribbles**
- Blanks i.e. “No Signatures”
  - **BB + BL + LL**
  - **36 + 5 + 4**
  - **45 Blanks**

Image Copy I	Image Copy II	Classification	Count
Signature	Signature	SS	15,288
Signature	Blank	SB	1,348
Signature	Likely Blank	SL	26
Signature	Scribble	SC	72
Scribble	Blank	CB	6
Scribble	Likely Blank	CL	7
Scribble	Scribble	CC	142
Blank	Blank	BB	36
Blank	Likely Blank	BL	5
Likely Blank	Likely Blank	LL	4
		<b>TOTAL</b>	<b>16,934</b>

### *3-Copy, and 4-Copy Duplicate Signature Presence Detection Results*

Type	Definitive Blanks	Likely Blanks	Scribbles	Signatures	Totals
3-Copy	40	2	16	506	564
4-Copy	2	0	0	14	16

**Table 9:** Three- & Four-Copy Duplicate Signature Presence Detection Results.

# Three-Copy Duplicate Blank

4338895.tiff

PBSigVar\_1377\_RTNIMAGOUT\_10142020\_0024/4338895.tiff



PBSigVar\_1377\_RTNIMAGOUT\_10242020\_0100/4338895.tiff



PBSigVar\_1377\_RTNIMAGOUT\_10282020\_0129/4338895.tiff



# Three-Copy Duplicate Scribble

459562.tiff

PBSigVar\_1377\_RTNIMAGOUT\_10122020\_0007/459562.tiff



PBSigVar\_1377\_RTNIMAGOUT\_10152020\_0037/459562.tiff



PBSigVar\_1377\_RTNIMAGOUT\_10262020\_0107/459562.tiff





## ***EchoMail Results***



## *Total Number of Blanks Calculation*

	Blanks
Non-Duplicate Blanks	1,872
2-Copy Duplicate Blanks	45
3-Copy Duplicate Blanks	2
<b>Total</b>	<b>1,919</b>

## *Total Number of Scribbles Calculation*

	Scribbles
Non-Duplicate Scribbles	2,420
2-Copy Duplicate Scribbles	155
3-Copy Duplicate Scribbles	5
<b>Total</b>	<b>2,580</b>

## *EchoMail Results Summary*

	<b>EchoMail Analysis</b>
<b>EVB Return Envelopes Received</b>	<b>1,929,240*</b>
<b>Duplicate Analysis</b>	
<b>Duplicates<sup>1</sup></b>	<b>(17,322)</b>
<b>Unique EVB Return Envelopes</b>	<b>1,911,918</b>
<b>Signature Presence Detection</b>	
<b>No Signature Ballots<sup>2</sup></b>	<b>(1,919)</b>
<b>Scribbles<sup>3</sup></b>	<b>(2,580)</b>
<b>EVBs Ready for Signature Verification</b>	<b>1,907,419</b>

## *Comparative Analysis*



## Comparative Analysis of EchoMail and Maricopa Reported

	EchoMail Analysis	Maricopa Reported	Variance
<b>EVB Return Envelopes Received</b>	<b>1,929,240*</b>	<b>Unknown</b>	<b>NA</b>
<b>Duplicate Analysis</b>			
<b>Duplicates<sup>7</sup></b>	<b>(17,322)</b>	<b>Un-reported</b>	<b>NA</b>
<b>Unique EVB Return Envelopes</b>	<b>1,911,918</b>	<b>1,918,463**</b>	<b>(6,545)</b>
<b>Signature Presence Detection</b>			
<b>No Signature Ballots<sup>8</sup></b>	<b>(1,919)</b>	<b>(1,455)</b>	<b>(464)</b>
<b>Scribbles<sup>9</sup></b>	<b>(2,580)</b>	<b>NA</b>	<b>(2580)</b>
<b>EVBs Ready for Signature Verification</b>	<b>1,907,419</b>	<b>1,917,008</b>	<b>(9,589)</b>
<b>Signature Verification</b>			
<b>“Bad Signatures”</b>	<b>NA</b>	<b>(587)</b>	<b>NA</b>
<b>“Late Returns”</b>	<b>NA</b>	<b>(934)</b>	<b>NA</b>
<b>Total EVBs Verified and Counted</b>	<b>NA</b>	<b>1,915,487</b>	<b>NA</b>

## ***Key Findings and Anomalies***

## *EchoMail Key Findings*

- Unknown how many EVB return envelopes were **originally** received by Maricopa
- 34,448 Duplicates from 17,126 Unique Voters. Maricopa reported NO Duplicates in *CANVASS report*.
- 464 *more* “No Signature” EVB Return Envelopes Identified by EchoMail
- 6,545 *more* unique EVB Return Envelopes processed by Maricopa
- 2,580 Scribbles in Signature Region i.e. “Bad Signatures”
  - Maricopa reported 587 “Bad Signatures” that is 0.031% of total EVBs received
- 9,589 *more* net EVBs submitted for Signature Verification by Maricopa versus EchoMail EVB return envelope images
- 25% Surge of Duplicates in Last Six Days
- Blanks of Duplicates being stamped “**VERIFIED & APPROVED MCTEC**”
- Stamps of “**VERIFIED & APPROVED MCTEC**” in Blank Signature Regions
- “**VERIFIED & APPROVED MCTEC**” Stamps Appearing “BEHIND” Envelope Triangle
- Two Different Voter-IDs, having Same Address/Phone/Name, with Matching Signatures



# *Anomaly #1*

## *Anomaly #1*

*Maricopa Reported Only 587 “Bad Signatures”  
Out of 1,918,463 (0.031%)*

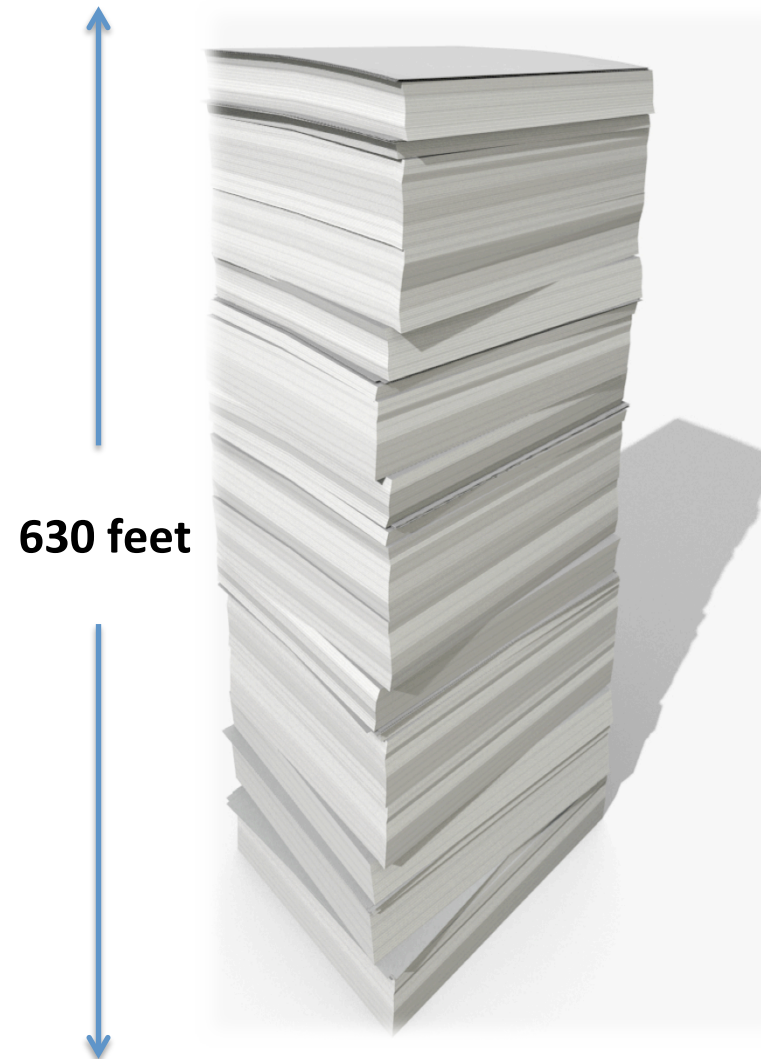
# *Anomaly #1*

ONE “Bad Signature”  
for EVERY 3,268 EVBs

# *Anomaly #1*

ONE "Bad Signature"  
for EVERY 3,268 EVBs

**1,918,463 EVBs**



# *Anomaly #1*

ONE "Bad Signature"  
for EVERY 3,268 EVBs

1,918,463 EVBs

630 feet



# Anomaly #1

ONE "Bad Signature"  
for EVERY 3,268 EVBs

1,918,463 EVBs

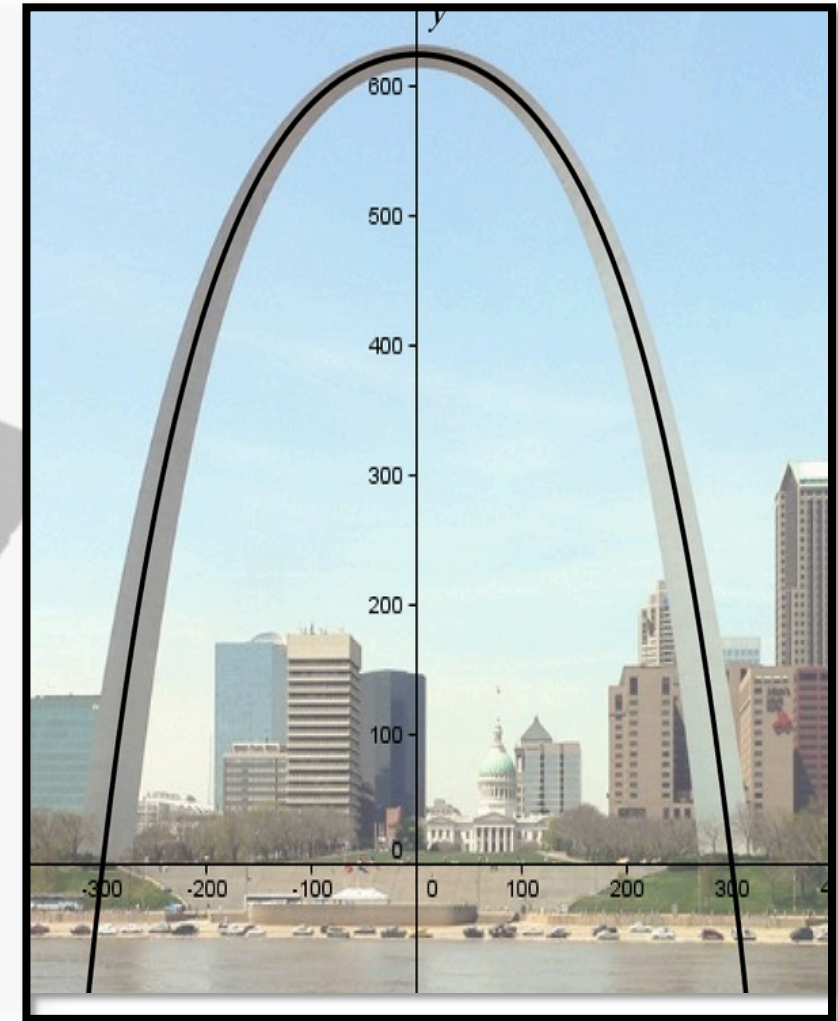
630 feet

2.31 inches

557 "Bad Signatures"



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# Anomaly #1

ONE "Bad Signature"  
for EVERY 3,268 EVBs

0.0306% of All EVB  
Return Envelopes

1,918,463 EVBs

630 feet

2.31 inches

557 "Bad Signatures"



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## *Anomaly #2*

ECHOMAIL

*2,580 “Bad Signatures” e.g. Scribbles Out of 1,911,918  
(0.135%)*



## *Anomaly #2*

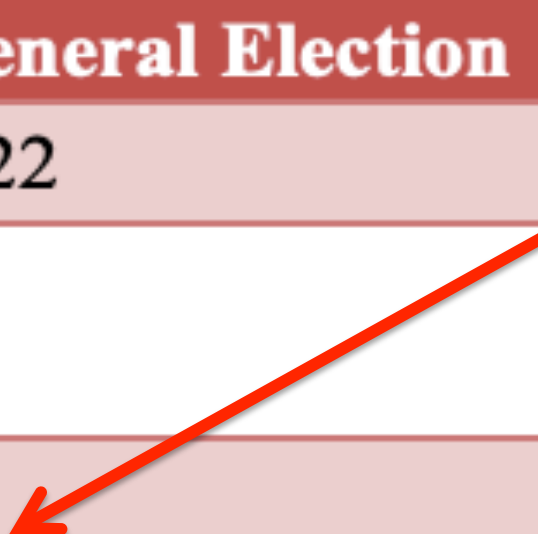
ECHOMAIL

*2,580 “Bad Signatures” e.g. Scribbles Out of 1,911,918  
(0.135%)*

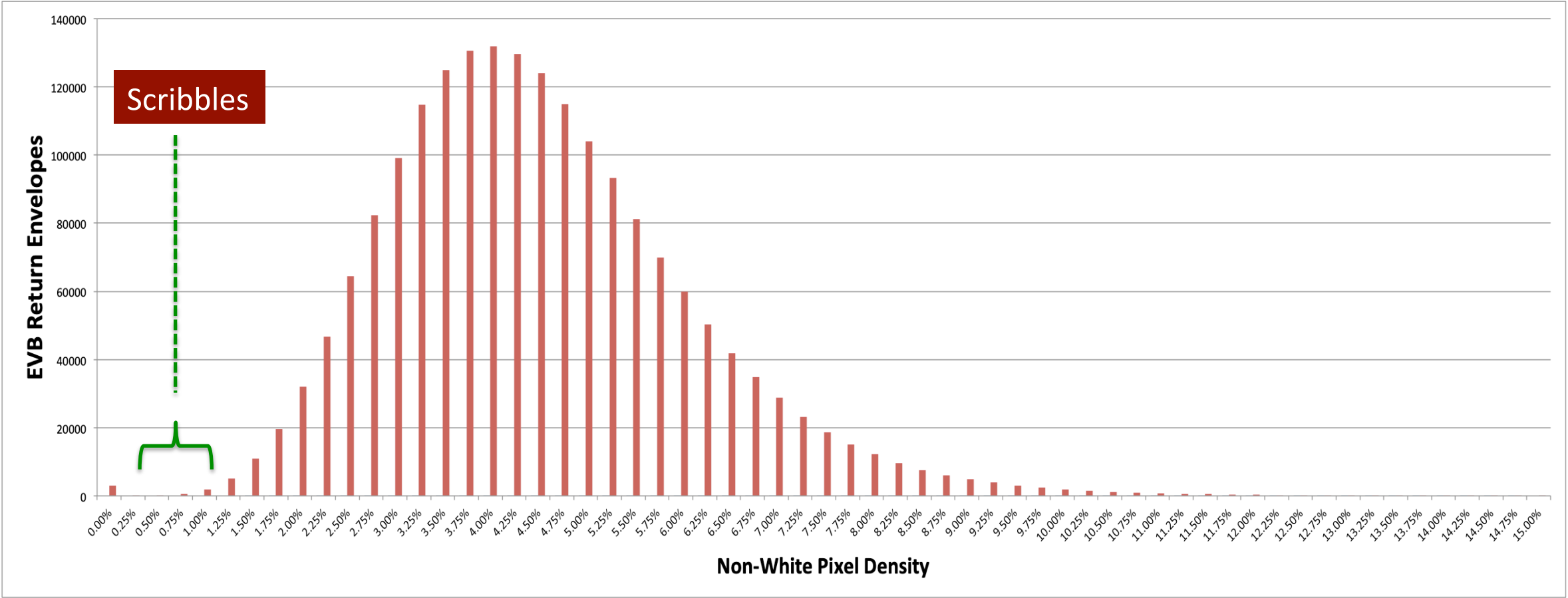
EchoMail was commissioned to identify presence of Blanks, Scribbles, Signatures in Signature Region, NOT to perform Signature Verification/Matching. If Scribbles ALONE were considered “Bad Signatures,” then EchoMail ITSELF identified 335% more “Bad Signatures” than Maricopa did from its ENTIRE Signature Verification process.

## *State of Arizona: 2016 General Election Signature Mismatch Rejection Rate*

State of Arizona 2016 General Election	
Mail-In Ballots	2,017,722
Rejection from Signature Mismatch	2,657
Signature Mismatch Rejection Rate	0.131%



# *%Non-White Pixel Density vs. EVB Return Envelope Volume*



# *Anomaly #3*

ECHOMAIL

*3% to 97% Increased Illegibility Rate of Signatures 4 days  
After Election Day*

## *Signatures 4-Weeks BEFORE Election Day*

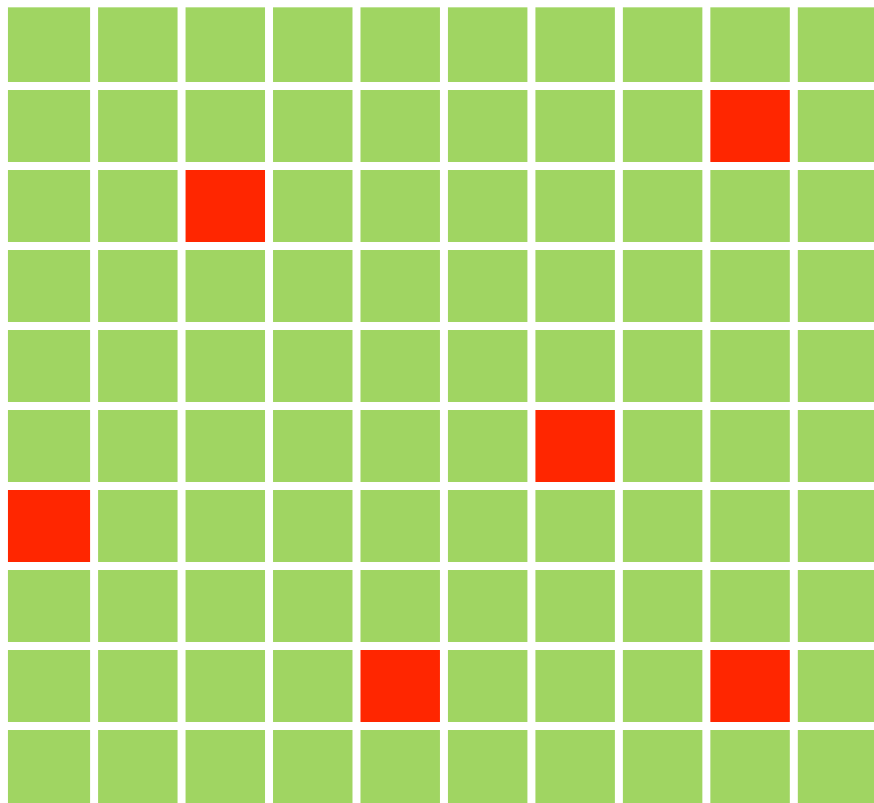
~95% Legible Signatures  
~5% Illegible Signatures

## *Signatures 4-Days AFTER Election Day*

~5% Legible Signatures  
~95% Illegible Signatures

# Random Sampling of Signatures:

## *4-Weeks Before Election vs. 4-Days After Election*

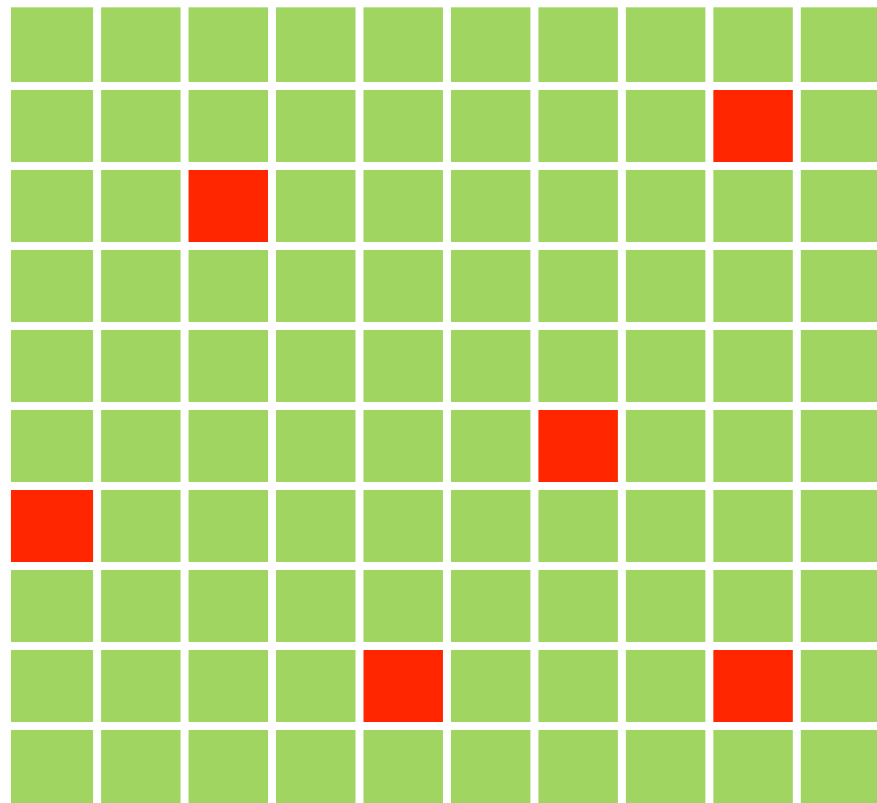


 Illegible

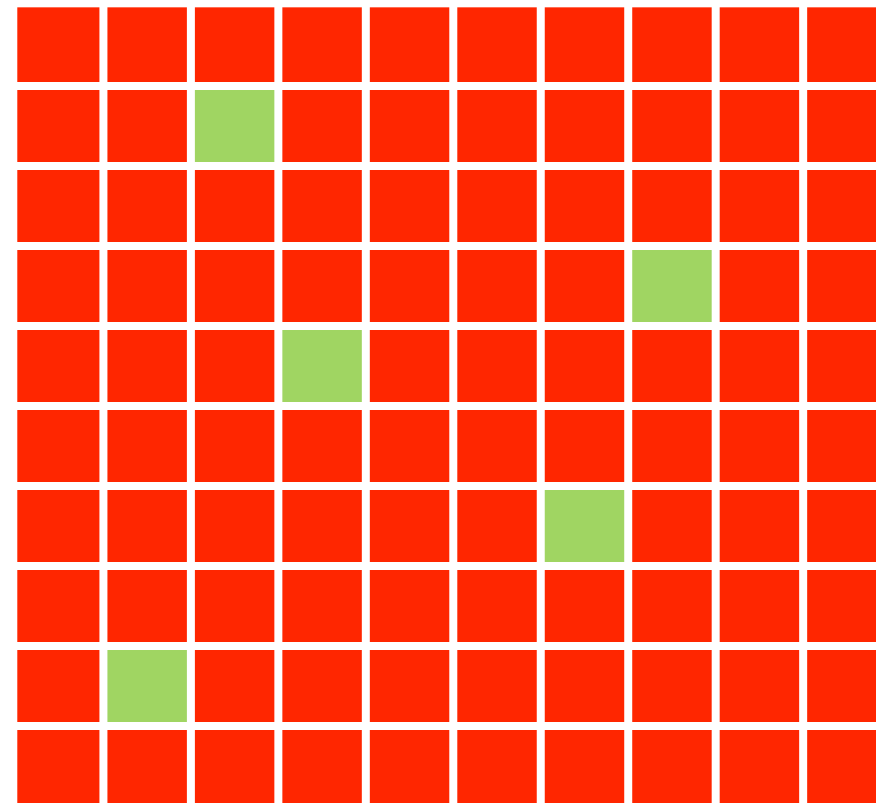
**4-Weeks Before Election**

# Random Sampling of Signatures:


## *4-Weeks Before Election vs. 4-Days After Election*




4-Weeks Before Election



4-Days After Election

 Illegible

 Legible



# *Anomaly #4*

ECHOMAIL

*As EVBs Increased by 53% from 2016 to 2020 in Maricopa,  
“Bad Signatures” Decreased by 56%*


## *Inverse Pattern: Increase in EVBs with Decrease in Signature Mismatch Rate*

Maricopa County 2016 General Election	
EVB Return Envelopes	1,257,179
Rejection from Signature Mismatch	1,456
Signature Mismatch Rejection Rate	0.116%



## *Inverse Pattern: Increase in EVBs with Decrease in Signature Mismatch Rate*

	<b>Maricopa County, AZ 2020 General Election</b>	<b>Maricopa County 2016 General Election</b>
EVB Return Envelopes	1,918,463	1,257,179
Rejection from Signature Mismatch	587	1,456
Signature Mismatch Rejection Rate	0.031%	0.116%




## *Inverse Pattern: Increase in EVBs with Decrease in Signature Mismatch Rate*

	Maricopa County, AZ 2020 General Election	Maricopa County 2016 General Election
EVB Return Envelopes	 1,918,463	1,257,179
Rejection from Signature Mismatch	587	1,456
Signature Mismatch Rejection Rate	0.031%	0.116%

## *Inverse Pattern: Increase in EVBs with Decrease in Signature Mismatch Rate*

	Maricopa County, AZ 2020 General Election	Maricopa County 2016 General Election
EVB Return Envelopes	 1,918,463	1,257,179
Rejection from Signature Mismatch	 587	1,456
Signature Mismatch Rejection Rate	0.031%	0.116%

## *Inverse Pattern: Increase in EVBs with Decrease in Signature Mismatch Rate*

	Maricopa County, AZ 2020 General Election	Maricopa County 2016 General Election
EVB Return Envelopes	 1,918,463	1,257,179
Rejection from Signature Mismatch	 587	1,456
Signature Mismatch Rejection Rate	 0.031%	0.116%

# *Anomaly #5*

## *Anomaly #5*

MARICOPA

*No Mention of Duplicates in Maricopa CANVASS Report*



## *Anomaly #5*

MARICOPA

### *No Mention of Duplicates in Maricopa CANVASS Report*

<b>GENERAL ELECTION</b>	
<b>VOTER TURNOUT</b>	
	<b>2020</b>
Voter Turnout	80.51%
Early Ballots Requested	2,160,412
Early Ballots Verified and Counted	1,915,487
Rejected Early Ballots	
Bad Signatures	587
No Signatures	1,455
Late Returns	934

## *Anomaly #5*

MARICOPA

*No Mention of Duplicates in Maricopa CANVASS Report*

ECHOMAIL

*17,126 Voters Sent in TWO or More Ballots (“Duplicates”)*

## *Anomaly #5*

Type	Total Images	Duplicate Images	Unique # of Voters
2-Copy Duplicates	33,868	16,934	16,934
3-Copy Duplicates	564	376	188
4-Copy Duplicates	<u>16</u>	<u>12</u>	<u>4</u>
<b>Total</b>	34,448	17,322	17,126

# *Anomaly #6*

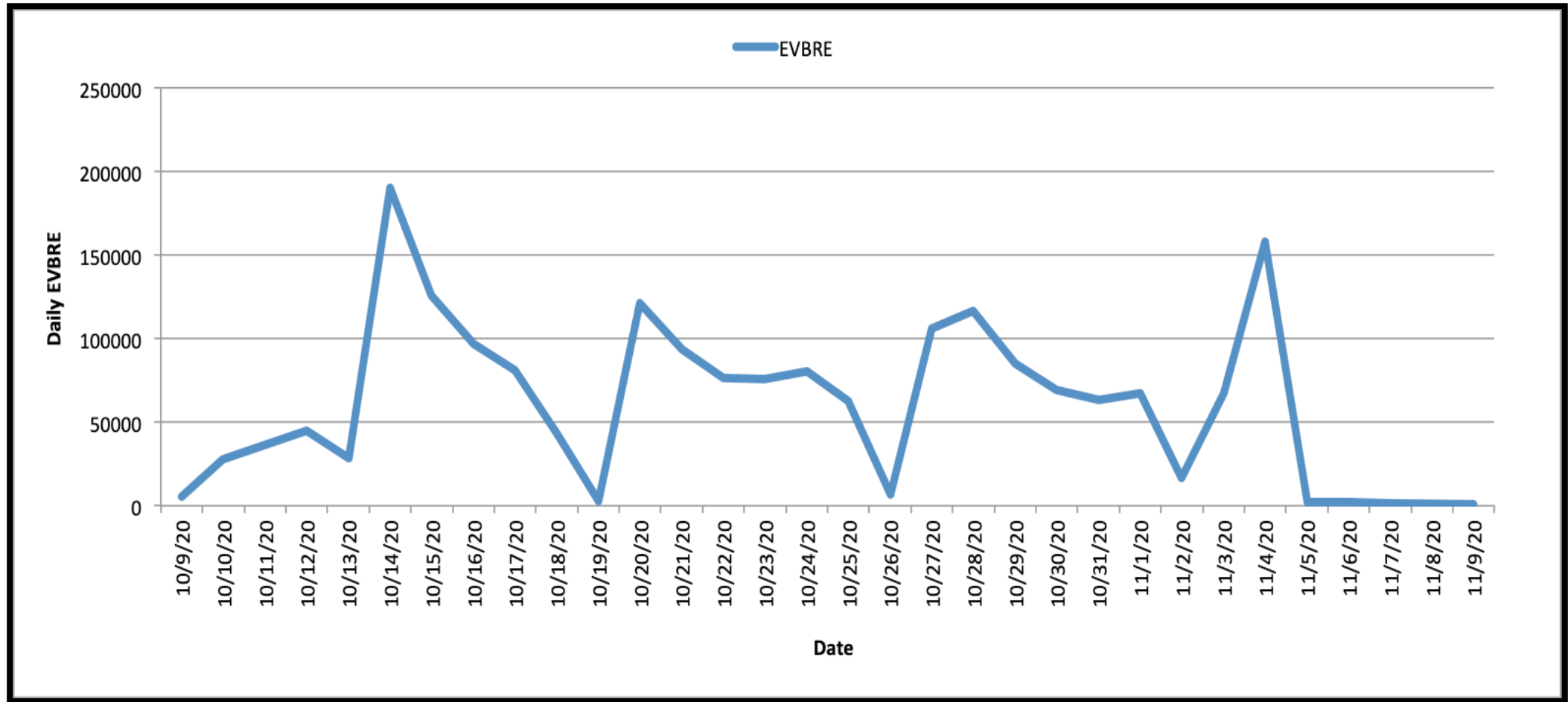


# *Anomaly #6*

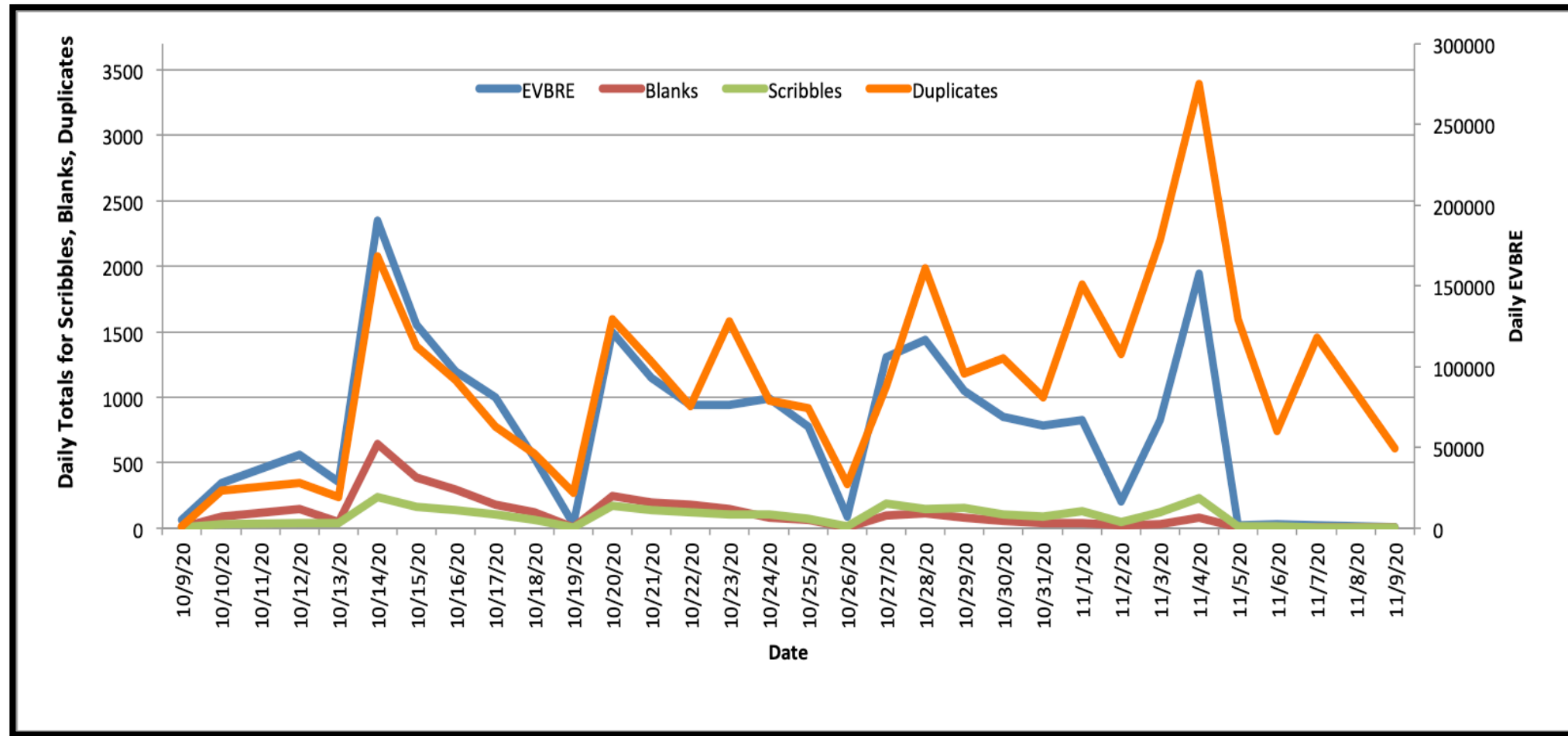
ECHOMAIL

*25%+ of Duplicates Came In During Nov. 4-9, 2020*

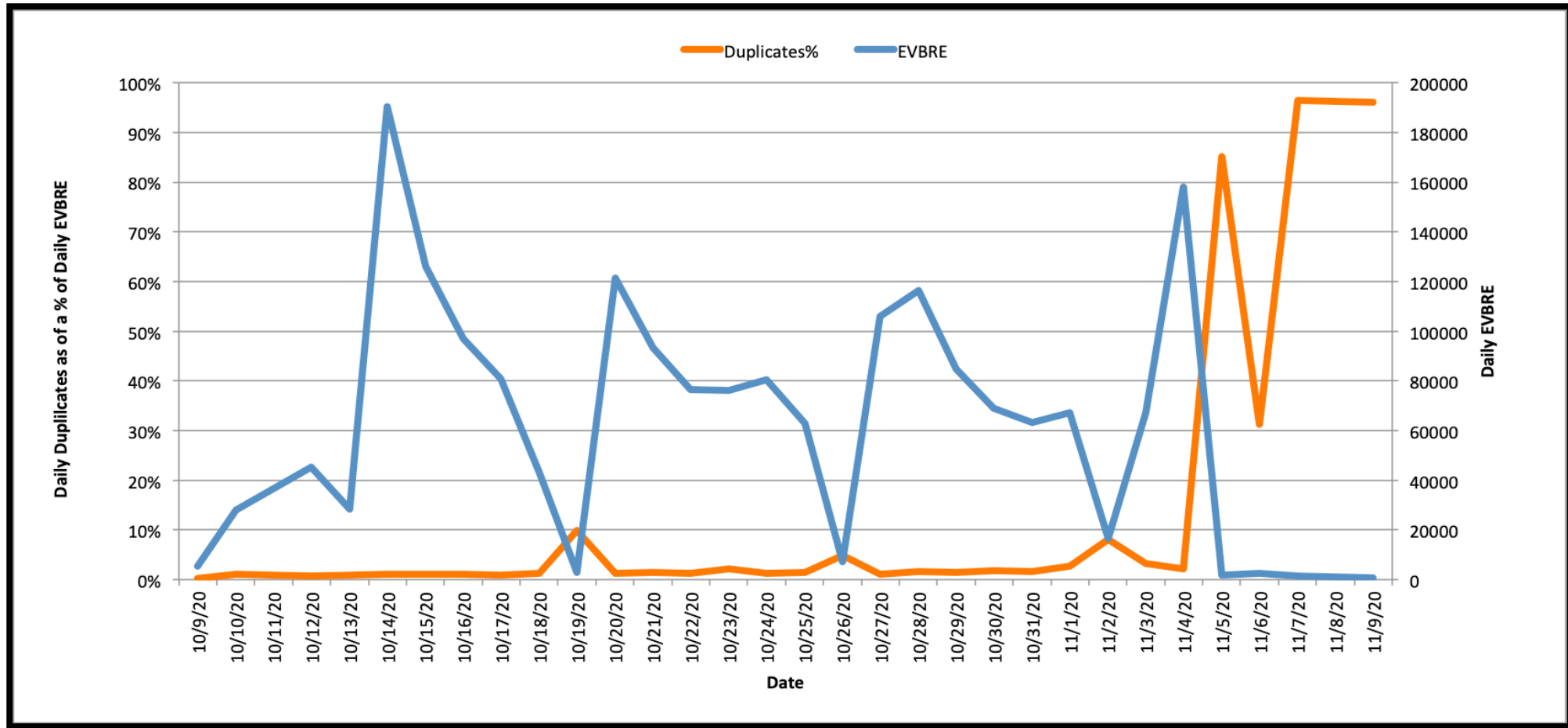
## Anomaly #6



# Anomaly #6



# Anomaly #6





# *Anomaly #7*



# *Anomaly #7*

ECHOMAIL

*EV33 System Had Only 9,382 Voters Who Submitted  
Duplicates vs. 17,126 Voters Identified by EchoMail*



## *Anomaly #7*

ECHOMAIL

*EV33 System Had Only 9,382 Voters Who Submitted Duplicates vs. 17,126 Voters Identified by EchoMail*

ECHOMAIL

*Of the 9,382 in EV33, ONLY 2,138 Voters Matched with Voters Among the 17,126*



# *Anomaly #8*



# *Anomaly #8*

ECHOMAIL

*Duplicate BLANKS were “VERIFIED & APPROVED”*



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# Duplicate Blanks

## Stamped and Approved – Example #1

NOV 3 2020 GENERAL ELECTION

[Redacted]

BALLOT WILL NOT BE COUNTED WITHOUT YOUR SIGNATURE  
POWERS OF ATTORNEY are not valid for voting purposes.  
LA BOLETA NO SE TRAMITAR SIN SU FIRMA.  
PODER DE ABOGADO no es valido para fines de votacion.

SIGN WITHIN THE BOX  
FIRME DENTRO DE LA CAJA

[Signature Box]

(PHONE, if signature is questioned) (DATE / FECHA)  
(TELEFONO, si la firma es cuestionada)

Within U.S. - MAIL no later than 6 days prior to Election Day (noted on ballot)

NOV 3 2020 GENERAL ELECTION

[Redacted]

BALLOT WILL NOT BE COUNTED WITHOUT YOUR SIGNATURE  
POWERS OF ATTORNEY are not valid for voting purposes.  
LA BOLETA NO SE TRAMITAR SIN SU FIRMA.  
PODER DE ABOGADO no es valido para fines de votación.

SIGN WITHIN THE BOX  
FIRME DENTRO DE LA CAJA

[Signature Box]

(PHONE, if signature is questioned) (DATE / FECHA)  
(TELEFONO, si la firma es cuestionada)

Within U.S. - MAIL no later than 6 days prior to Election Day (noted on ballot)

APPROVED MCTEC

# Duplicate Blanks

## Stamped and Approved - Example #2

MARICOPA COUNTY  
NOV 3 2020 GENERAL ELECTION

**BALLOT WILL NOT BE COUNTED WITHOUT YOUR SIGNATURE. POWERS OF ATTORNEY are not valid for voting purposes.**

**LA BOLETA NO SE TRAMITAR SIN SU FIRMA. PODER DE ABOGADO no es valido para fines de votacion.**

**SIGN WITHIN THE BOX  
FIRME DENTRO DE LA CAJA**

(PHONE, if signature is questioned)  
(TELÉFONO, si la firma es cuestionada)

(DATE / FECHA)

Within U.S. - MAIL no later than 6 days prior to Election Day (noted on ballot)

MARICOPA COUNTY  
NOV 3 2020 GENERAL ELECTION

**BALLOT WILL NOT BE COUNTED WITHOUT YOUR SIGNATURE. POWERS OF ATTORNEY are not valid for voting purposes.**

**LA BOLETA NO SE TRAMITAR SIN SU FIRMA. PODER DE ABOGADO no es valido para fines de votacion.**

**SIGN WITHIN THE BOX  
FIRME DENTRO DE LA CAJA**

(PHONE, if signature is questioned)  
(TELÉFONO, si la firma es cuestionada)

(DATE / FECHA)

Within U.S. - MAIL no later than 6 days prior to Election Day (noted on ballot)

# Duplicate Blanks

## Stamped and Approved - Example #3

MANIFEST COUNTY  
NOV 3 2020 GENERAL ELECTION

**AVC**

BALLOT WILL NOT BE COUNTED WITHOUT YOUR SIGNATURE. POWERS OF ATTORNEY are not valid for voting purposes.

LA BOLETA NO SE TRAMITAR SIN SU FIRMA. PODER DE ABOGADO no es válido para fines de votación.

**SIGN WITHIN THE BOX**  
**FIRME DENTRO DE LA CAJA**

(PHONE, if signature is questioned) (TELÉFONO, si la firma es cuestionada)

(DATE / FECHA)

Within U.S. - MAIL no later than 6 days prior to Election Day (noted on ballot)

MANIFEST COUNTY  
NOV 3 2020 GENERAL ELECTION

**AVC**

BALLOT WILL NOT BE COUNTED WITHOUT YOUR SIGNATURE. POWERS OF ATTORNEY are not valid for voting purposes.

LA BOLETA NO SE TRAMITAR SIN SU FIRMA. PODER DE ABOGADO no es válido para fines de votación.

**SIGN WITHIN THE BOX**  
**FIRME DENTRO DE LA CAJA**

(PHONE, if signature is questioned) (TELÉFONO, si la firma es cuestionada)

(DATE / FECHA)

Within U.S. - MAIL no later than 6 days prior to Election Day (noted on ballot)



# Duplicate Blanks

## Stamped and Approved - Example #4

NOV 3 2020 GENERAL ELECTION

[Redacted]

BALLOT WILL NOT BE COUNTED WITHOUT YOUR SIGNATURE. POWERS OF ATTORNEY are not valid for voting purposes.

LA BOLETA NO SE TRAMITAR SIN SU FIRMA. PODER DE ABOGADO no es válido para fines de votación.

**SIGN WITHIN THE BOX**  
**FIRME DENTRO DE LA CAJA**

[Signature Box]

(PHONE, if signature is questioned) (TELÉFONO, si la firma es cuestionada) (DATE / FECHA)

Within U.S. - MAIL no later than 6 days prior to Election Day (noted on ballot)  
Dentro de EE.UU. - ENVÍE a más tardar 6 días antes del Día de la Elección (anotado en la boleta)

NOV 3 2020 GENERAL ELECTION

[Redacted]

NOV 3 2020 11:16

BALLOT WILL NOT BE COUNTED WITHOUT YOUR SIGNATURE. POWERS OF ATTORNEY are not valid for voting purposes.

LA BOLETA NO SE TRAMITAR SIN SU FIRMA. PODER DE ABOGADO no es válido para fines de votación.

**SIGN WITHIN THE BOX**  
**FIRME DENTRO DE LA CAJA**

[Signature Box]

(PHONE, if signature is questioned) (TELÉFONO, si la firma es cuestionada) (DATE / FECHA)

Within U.S. - MAIL no later than 6 days prior to Election Day (noted on ballot)

# Three-Copy Duplicate Blanks (2 Approved)

NOV 3 2020 GENERAL ELECTION

BALLOT WILL NOT BE  
COUNTED WITHOUT  
YOUR SIGNATURE.  
POWERS OF ATTORNEY  
are not valid for voting  
purposes.

LA BOLETA NO SE  
TRAMITAR SIN SU  
FIRMA.  
PODER DE ABOGADO  
no es válido para fines  
de votación.

SIGN WITHIN THE BOX  
FIRME DENTRO DE LA CAJA

[Signature Box]

[Redacted Box] 10/13/2020  
(PHONE, if signature is questioned) (DATE / FECHA)  
(TELÉFONO, si la firma es cuestionada)

Within U.S. - MAIL no later than 6 days prior to Election Day (noted on ballot)

NOV 3 2020

BALLOT WILL NOT BE  
COUNTED WITHOUT  
YOUR SIGNATURE.  
POWERS OF ATTORNEY  
are not valid for voting  
purposes.

LA BOLETA NO SE  
TRAMITAR SIN SU  
FIRMA.  
PODER DE ABOGADO  
no es válido para fines  
de votación.

SIGN WITHIN THE BOX  
FIRME DENTRO DE LA CAJA

[Signature Box]

[Redacted Box] 10/13/2020  
(PHONE, if signature is questioned) (DATE / FECHA)  
(TELÉFONO, si la firma es cuestionada)

Within U.S. - MAIL no later than 6 days prior to Election Day (noted on ballot)

085

NOV 3 2020

BALLOT WILL NOT BE  
COUNTED WITHOUT  
YOUR SIGNATURE.  
POWERS OF ATTORNEY  
are not valid for voting  
purposes.

LA BOLETA NO SE  
TRAMITAR SIN SU  
FIRMA.  
PODER DE ABOGADO  
no es válido para fines  
de votación.

SIGN WITHIN THE BOX  
FIRME DENTRO DE LA CAJA

[Signature Box]

[Redacted Box] 10/13/2020  
(PHONE, if signature is questioned) (DATE / FECHA)  
(TELÉFONO, si la firma es cuestionada)

Within U.S. - MAIL no later than 6 days prior to Election Day (noted on ballot)



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# Three-Copy Duplicate Blanks

NOV 3 2020 GENERAL ELECTION

BALLOT WILL NOT BE  
COUNTED WITHOUT  
YOUR SIGNATURE.  
POWERS OF ATTORNEY  
are not valid for voting  
purposes.

LA BOLETA NO SE  
TRAMITAR SIN SU  
FIRMA.  
PODER DE ABOGADO  
no es válido para fines  
de votación.

SIGN WITHIN THE BOX  
FIRME DENTRO DE LA CAJA

(PHONE, if signature is questioned) (TELÉFONO, si la firma es cuestionada)	10/13/2020 (DATE / FECHA)

Within U.S. - MAIL no later than 6 days prior to Election Day (noted on ballot)

NOV 3 2020 GENERAL ELECTION

BALLOT WILL NOT BE  
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POWERS OF ATTORNEY  
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no es válido para fines  
de votación.

SIGN WITHIN THE BOX  
FIRME DENTRO DE LA CAJA

(PHONE, if signature is questioned) (TELÉFONO, si la firma es cuestionada)	10/13/2020 (DATE / FECHA)

Within U.S. - MAIL no later than 6 days prior to Election Day (noted on ballot)

NOV 3 2020 GENERAL ELECTION

BALLOT WILL NOT BE  
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YOUR SIGNATURE.  
POWERS OF ATTORNEY  
are not valid for voting  
purposes.

LA BOLETA NO SE  
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PODER DE ABOGADO  
no es válido para fines  
de votación.

SIGN WITHIN THE BOX  
FIRME DENTRO DE LA CAJA

(PHONE, if signature is questioned) (TELÉFONO, si la firma es cuestionada)	10/13/2020 (DATE / FECHA)

Within U.S. - MAIL no later than 6 days prior to Election Day (noted on ballot)



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# *Anomaly #9*

ECHOMAIL

*“VERIFIED & APPROVED” in Blank Signature Region*

# Stamped in Blank Signature Region

NOV 3 2020 GENERAL ELECTION

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BALLOT WILL NOT BE  
COUNTED WITHOUT  
YOUR SIGNATURE.

POWERS OF ATTORNEY  
are not valid for voting  
purposes.

LA BOLETA NO SE  
TRAMITAR SIN

FIRMA  
PODER DE ABOGADO  
no es válido para fines  
de votación.

SIGN WITHIN THE BOX  
FIRME DENTRO DE LA CAJA

VERIFIED & APPROVED MCTEC

(PHONE, if signature is questioned)  
(TELÉFONO, si la firma es cuestionada)

(DATE / FECHA)

Within U.S. - MAIL no later than 6 days prior to Election Day (noted on ballot)

NOV 3 2020 GENERAL ELECTION

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BALLOT WILL NOT BE  
COUNTED WITHOUT  
YOUR SIGNATURE

POWERS OF ATTORNEY  
are not valid for voting  
purposes.

LA BOLETA NO SE  
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FIRMA  
PODER DE ABOGADO  
no es válido para fines  
de votación.

SIGN WITHIN THE BOX  
FIRME DENTRO DE LA CAJA

VERIFIED & APPROVED-MCTEC

(PHONE, if signature is questioned)  
(TELÉFONO, si la firma es cuestionada)

(DATE / FECHA)

Within U.S. - MAIL no later than 6 days prior to Election Day (noted on ballot)



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# Stamped in Blank Signature Region

NOV 3 2020 GENERAL ELECTION



10 20 12 25 31

BALLOT WILL NOT BE  
COUNTED WITHOUT  
YOUR SIGNATURE.

POWERS OF ATTORNEY  
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10-17-20

Within U.S. - MAIL no later than 6 days prior to Election Day (noted on ballot)

NOV 3 2020 GENERAL ELECTION



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(TELEFONO, si la firma es cuestionada)

(DATE / FECHA)

Within U.S. - MAIL no later than 6 days prior to Election Day (noted on ballot)



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# Stamped in Blank Signature Region

NOV 3 2020 GENERAL ELECTION

NOV 3 2020 GENERAL ELECTION

BALLOT WILL NOT BE  
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POWERS OF ATTORNEY  
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VERIFIED & APPROVED MCTEC

(PHONE, if signature is questioned)  
(TELEFONO, si la firma es cuestionada)

(DATE / FECHA)

Within U.S. - MAIL no later than 6 days prior to Election Day (noted on ballot)

NOV 3 2020 GENERAL ELECTION

NOV 3 2020 GENERAL ELECTION

BALLOT WILL NOT BE  
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VERIFIED & APPROVED-MCTEC

(PHONE, if signature is questioned)  
(TELEFONO, si la firma es cuestionada)

(DATE / FECHA)

Within U.S. - MAIL no later than 6 days prior to Election Day (noted on ballot)



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# *Anomaly #10*

ECHOMAIL

*Two Different Voter-Ids with Same Name/Address Phone  
Number with **MATCHING** Signatures*



# Same Name/Address/Signature/Phone, Two Different Voter IDs

NOV 3 2020 GENERAL ELECTION  
John Doe A's Address  
John Doe A

BALLOT WILL NOT BE COUNTED WITHOUT YOUR SIGNATURE.  
POWERS OF ATTORNEY are not valid for voting purposes.

LA BOLETA NO SE TRAMITAR SIN SU FIRMA.  
PODER DE ABOGADO no es valido para fines de votación.

SIGN WITHIN THE BOX  
FIRME DENTRO DE LA CAJA

John Doe A's Signature

John Doe A's Phone#

(PHONE, if signature is questioned)  
(TELÉFONO, si la firma es cuestionada)

10/9/2020  
(DATE / FECHA)

Within U.S. - MAIL no later than 6 days prior to Election Day (noted on ballot)

NOV 3 2020 GENERAL ELECTION  
John Doe A's Address  
John Doe A

BALLOT WILL NOT BE COUNTED WITHOUT YOUR SIGNATURE.  
POWERS OF ATTORNEY are not valid for voting purposes.

LA BOLETA NO SE TRAMITAR SIN SU FIRMA.  
PODER DE ABOGADO no es válido para fines de votación.

SIGN WITHIN THE BOX  
FIRME DENTRO DE LA CAJA

John Doe A's Signature

John Doe A's Phone#

(PHONE, if signature is questioned)  
(TELÉFONO, si la firma es cuestionada)

10/16/2020  
(DATE / FECHA)

Within U.S. - MAIL no later than 6 days prior to Election Day (noted on ballot)



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# Same Name/Address/Signature/Phone, Two Different Voter IDs

MANICOT COUNTY NOV 3 2020 GENERAL ELECTION  
Jane Doe A's Address  
Jane Doe A

**BALLOT WILL NOT BE COUNTED WITHOUT YOUR SIGNATURE. POWERS OF ATTORNEY are not valid for voting purposes.**  
**LA BOLETA NO SE TRAMITAR SIN SU FIRMA. PODER DE ABOGADO no es válido para fines de votación.**

**SIGN WITHIN THE BOX  
FIRME DENTRO DE LA CAJA**

Jane Doe A's Signature

Jane Doe A's Phone# 10/15/2020  
(PHONE, if signature is questioned) (TELÉFONO, si la firma es cuestionada) (DATE / FECHA)

Within U.S. - MAIL no later than 6 days prior to Election Day (noted on ballot)

MANICOT COUNTY NOV 3 2020 GENERAL ELECTION  
Jane Doe A's Address  
Jane Doe A

**BALLOT WILL NOT BE COUNTED WITHOUT YOUR SIGNATURE. POWERS OF ATTORNEY are not valid for voting purposes.**  
**LA BOLETA NO SE TRAMITAR SIN SU FIRMA. PODER DE ABOGADO no es válido para fines de votación.**

**SIGN WITHIN THE BOX  
FIRME DENTRO DE LA CAJA**

Jane Doe A's Signature

Jane Doe A's Phone# 10/37/2020  
(PHONE, if signature is questioned) (TELÉFONO, si la firma es cuestionada) (DATE / FECHA)

Within U.S. - MAIL no later than 6 days prior to Election Day (noted on ballot)

# Same Name/Address/Signature/Phone, Two Different Voter IDs

NOV 3 2020 GENERAL ELECTION  
Jane Doe B's Address  
Jane Doe B

BALLOT WILL NOT BE COUNTED WITHOUT YOUR SIGNATURE  
POWERS OF ATTORNEY are not valid for voting purposes.  
LA BOLETA NO SE TRAMITAR SIN SU FIRMA  
PODER DE ABOGADO no es válido para fines de votación.

SIGN WITHIN THE BOX  
FIRME DENTRO DE LA CAJA

Jane Doe B's Signature

(PHONE, if signature is questioned)  
(TELÉFONO, si la firma es cuestionada)

(DATE / FECHA)

Within U.S. - MAIL no later than 6 days before Election Day (noted on ballot)

NOV 3 2020 GENERAL ELECTION  
Jane Doe B's Address  
Jane Doe B

BALLOT WILL NOT BE COUNTED WITHOUT YOUR SIGNATURE  
POWERS OF ATTORNEY are not valid for voting purposes.  
LA BOLETA NO SE TRAMITAR SIN SU FIRMA  
PODER DE ABOGADO no es válido para fines de votación.

SIGN WITHIN THE BOX  
FIRME DENTRO DE LA CAJA

Jane Doe B's Signature

(PHONE, if signature is questioned)  
(TELÉFONO, si la firma es cuestionada)

10-14-20  
(DATE / FECHA)

Within U.S. - MAIL no later than 6 days prior to Election Day (noted on ballot)

# *Anomaly #11*

ECHOMAIL

*“VERIFIED & APPROVED STAMP” Behind Envelope Triangle*

1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 2679, 2680, 26

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**POWERS OF ATTORNEY**  
are not valid for voting  
purposes.

**PODER DE ABOGADO**  
**no es válido para fines**  
**de votación.**

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**Within U.S. - MAIL no later than 6 days prior to Election Day (noted on ballot)**

WILL NOT BE  
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POWERS OF ATTORNEY  
are not valid for voting  
purposes.

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PODER DE ABOGADO

WILL NOT BE  
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YOUR SIGNATURE.  
POWERS OF ATTORNEY  
not valid for voting  
purposes.

LA BOLETA NO SE  
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PODER DE ABOGADO  
es valido para fines  
de votacion.

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WILL NOT BE  
UTILIZED WITHOUT  
SIGNATURE.  
POWERS OF ATTORNEY  
are not valid for voting  
purposes.

LA BOLETA NO SE  
PUEDE UTILIZAR SIN SU  
FIRMA

COUNTED WITHOUT  
YOUR SIGNATURE  
POWERS OF ATTORNEY  
are not valid for voting  
purposes.

LA BOLETA NO SE  
TRAMITAR SIN SU  
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WILL NOT BE  
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LA BOLETA NO SE  
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PODER DEL ABOGADO  
es válido para fines  
de votación.

VERIFIED & APPROVED  
MCTEC  
(PHO)  
(TELI)

AT YOUR  
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VERIFIED & APPROVED  
MCTEC  
(PHO)  
(TELI)

## *Questions to Maricopa Election Officials*



## *Questions for Maricopa*

- Did Maricopa County receive any duplicate EVBs
  - EchoMail identified 34,448 EVB return envelope images being 2-copy, 3-copy and 4-copy Duplicates originating from 17,126 unique voters, while no Duplicates were reported in Maricopa's *CANVASS* report
- Is the reason that EchoMail has **more** "No Signatures" than reported by Maricopa because EchoMail analyzed solely the Signature Region? If not, why?
  - EchoMail identified 1,919 Blanks in Signature Region of EVB return envelopes
  - Maricopa reported 1,455 "No Signatures" in EVB return envelopes

## *Questions for Maricopa*

- Why did EchoMail detect more Scribbles than Maricopa's reporting of "Bad Signatures"?
  - EchoMail identified 2,580 Scribbles in Signature Region of EVB return envelopes
  - Maricopa reported 587 "Bad Signatures" from its Signature Verification
  - Had EchoMail been commissioned to identify "Bad Signatures," at least 2,580 Scribbles would have been classified as "Bad Signatures;" 1,993 more "Bad Signatures" than the 587 identified by Maricopa
- Are the date stamps on the directories for SIFs, in the data set provided to EchoMail, the date in which the Maricopa election officials received the EVB return envelopes?

## *Questions for Maricopa*

- Why does the approval stamp, “**VERIFIED & APPROVED MCTEC**” appear to exist only on a relatively small subset of EVB return envelopes?
- Did Maricopa stamp some EVB return envelopes as “**VERIFIED & APPROVED MCTEC**” even though **Signature Region is blank**, since they found a signature elsewhere i.e. outside of the Signature Region, during Signature Verification?
- What is the Standard Operating Procedure (“SOP”) for the EVB processing?
- What is the SOP for Signature Verification and curing of questionable signatures?
- What is the Chain of Custody for EVB return envelopes?

## *Questions for Maricopa*

- Why is the surge in Duplicates (and Blanks and Scribbles) during 11/04/2020 to 11/09/2020 incongruent with the trend of EVBRE daily counts during the same period?
- Why is the “**VERIFIED & APPROVED MCTEC**” stamp appearing “behind” the printed envelope triangle?
- Can Two Voter-IDs be associated with the same person at the same address with matching signatures?
- Why are Blanks being stamped as “**VERIFIED & APPROVED MCTEC?**”
- Why is the stamp “**VERIFIED & APPROVED MCTEC**” appearing in a blank Signature Region?

## *Conclusion & Summary*



## *Conclusion & Summary*

- The EVB Return Envelope IS the CONTAINER of the Ballot
- Significant opportunities to enhance:
  - Precision
  - Verifiability
  - Reliability
  - Auditability
  - Reproducibility

## *Future Research*

- Full Signature Verification Audit is Necessary
- Systems analysis needed to quantify efficacy of the current Signature Verification process
  - Acquire Maricopa County's SOP for signature verification
  - Acquire Maricopa County's 27-point analysis algorithm for signature comparison
  - Replicate signature verification process to scientifically calculate false positives, false negatives, error rate to determine a true confidence value of the signature verification of EVBs
- Need to review Chain of Custody
  - How were the signatures verified in communications
  - Phone/Email



## Author's Bio

Dr. Shiva Ayyadurai, MIT PHD, SMME, SMVS, SBEE, the inventor of email and polymath, holds four degrees from MIT, is a world-renowned engineer, systems scientist, inventor and entrepreneur. He is a Fulbright Scholar, Lemelson-MIT Awards Finalist, India's First Outstanding Scientist and Technologist of Indian Origin, Westinghouse Science Talent Honors Award recipient, and a nominee for the U.S. National Medal of Technology and Innovation. He holds multiple patents, is the author of twenty books, and has published original research, in leading peer-reviewed high-impact scientific journals including *IEEE*, *IJPRAI*, *Nature Neuroscience*, *CELL Biophysical Journal*, that have received thousands of citations. He has started seven successful high-tech companies, received numerous industry awards, consults for Global 2000 organizations and government, and has been invited to present Keynote and Distinguished lectures at leading institutions such as NSF, NIH, FDA, Harvard, and at MIT, where he delivered the Presidential Fellows Lecture.<sup>1</sup>

In 1978, as a 14-year-old, he was recruited as a Research Fellow by the University of Medicine and Dentistry of New Jersey (UMDNJ), in Newark, NJ after graduating with Honors from a special program in Computer Science at the Courant Institute of Mathematical Science at NYU. At UMDNJ, he invented email – **the system** as we know it today – when he was the first to convert the old-fashioned *interoffice paper-based mail system* consisting of the Inbox, Outbox, Memo (To:, From:, Date:, Subject:, Cc:, Bcc:), Attachments, Folders, etc. into its electronic equivalent by writing 50,000 lines of code to create a software system, which he named "Email," – a term never used before in the English language – and went on to be awarded the first U.S. Copyright *TXu 111-775* for "EMAIL, COMPUTER PROGRAM FOR ELECTRONIC MAIL SYSTEM" recognizing him as the inventor of email at a time when Copyright was the only legal mechanism to protect software inventions. Only in 1994 did the Federal Circuit recognize software as a "digital machine" allowing for software patents. Email is not the simple exchange of text messages. Dr. Shiva has never claimed to be the inventor of electronic messaging, which predates email - the system that he created in 1978.<sup>2,3</sup>

Recognizing his talents in software programming, UMDNJ gave him the opportunity to conduct medical research focused on developing pattern recognition classification methods for categorization of sleep signature patterns from babies with Sudden Infant Death Syndrome (SIDS). His research was published in *IEEE* and presented at the IEEE-EMBS conference in Espoo, Finland. Since that time and for more than forty years, his research and development efforts in academia and industry have been focused in the field of pattern recognition classification systems, systems science, and development of large-scale computational systems for analysis of diverse signals and signatures across a range of industries: biology and medicine, engineering (e.g. aeronautical, civil, mechanical, electrical), banking, finance, and, government, as well as across a diversity of applications including handwriting recognition of courtesy amounts on bank checks, automatic analysis and classification of electronic documents e.g. email, ultrasonic and radar wave signature classification for

<sup>1</sup>Dr. Shiva Ayyadurai, Biography and Curriculum Vitae, <https://vashiva.com/about-va-shiva-ayyadurai/>

<sup>2</sup>Facts on the invention of email, <https://www.inventorofemail.com/thefacts/>

<sup>3</sup>The Man Who Invented Email, TIME, <https://techland.time.com/2011/11/15/the-man-who-invented-email/>





# *Author's Bio*

non-destructive evaluation (NDE), signals analysis of Tahoma feature identification, biomarker analysis for determining signatures of efficacy for multi-combination therapies, image analysis for cardiology, and signal detection of fluid flow anomalies in fluidized bed reactors.

He earned a Bachelors in Electrical Engineering and Computer Science, a Masters in Mechanical Engineering, and another Masters in Visual Studies from the MIT Media Laboratory. In the midst of his PhD research in 1993, where he aimed to create a generalized platform – Information Cybernetics – for pattern recognition, he won an industry-wide competition sponsored by the White House, Executive Office of the President, to automatically analyze and classify President Clinton's email, resulting in his developing EchoMail® - a platform for automatic classification of electronic documents –, and subsequently launching EchoMail, Inc., a company that grew to nearly \$200 million in market valuation. EchoMail today applies its technologies across a diversity of applications.

In 2003, he returned to MIT complete his doctoral work in systems biology in the department of Biological Engineering where he developed CytoSolve®, a scalable computational systems biology platform for mathematically modeling the whole cell. Following his PhD, Dr. Shiva was selected for a Fulbright Fellowship returning him to India where he discovered the systems theoretic basis of eastern systems of medicine resulting in Systems Health®, a new educational program that provides a scientific foundation for integrative medicine. In 2012, Dr. Shiva launched CytoSolve, Inc. with the aim of modeling complex diseases and biomolecular processes to discover multi-combination medicines. His efforts led to CytoSolve earning an FDA allowance for a multi-combination therapy for pancreatic cancer in a record eleven months, developing innovative nutraceutical products, and garnering numerous industry and academic partnerships.

As an educator dedicated to the field of systems science and systems thinking, Dr. Shiva pioneered Systems Visualization, a course he taught at MIT to graduate and undergraduate students, which integrated systems theory, narrative story telling, metaphors, and data science to provide a pedagogy for visualization of complex systems. He founded the International Center for Integrative Systems, a research and educational institution and home to Innovation Corps and R.A.W./C.L.E.A.N. Food Certified, for broader applications of systems science.

Dr. Shiva has appeared in The MIT Technology Review, TIME, The Wall Street Journal, New York Times, NBC News, USA Today and other major media. Dr. Shiva was named Top 40 Under 40 in the Improper Bostonian. He continues his passion for entrepreneurialism as Managing Director of General Interactive to incubate, mentor and fund new startups in various areas including healthcare, media, biotechnology, information technology, to name a few.

Dr. Shiva is a member of Sigma-Xi, Eta Kappa Nu, and Tau Beta Pi.



# **Pattern Recognition Classification of Early Voting Ballot (EVB) Return Envelope Images for Signature Presence Detection**

*An Engineering Systems Approach to Identify Anomalies to Advance Integrity of U.S. Election Processes*

**Dr. Shiva Ayyadurai, MIT PhD**  
**SMVS, SMME, SBEE**

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