A Quest for Inspiration:
How Users Create and Reuse PINs

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Who Are You?! Adventures in Authentication Workshop (WAY) 2020

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PIN – Personal Identification Number

- Ubiquitous

- Easy to use

- Usually required as backup

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Previous Work

CAPABILITIES OF HUMAN
MEMORY WITH RESPECT
TO MEMORIZING PINS

ALTERNATIVE WAYS OF
ENTERING/USING PINS
TO INCREASE SECURITY
AND EASINESS OF USE

MOST COMMON PINS
AND PASSWORDS

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Why Study PINs Separately from Passwords

Intrinsic differences between passwords and PINs:

- Space of possible options

  numbers **VS** numbers, letters, symbols

- Usage context

  PIN pad in grocery store **VS** laptop at home

- Size

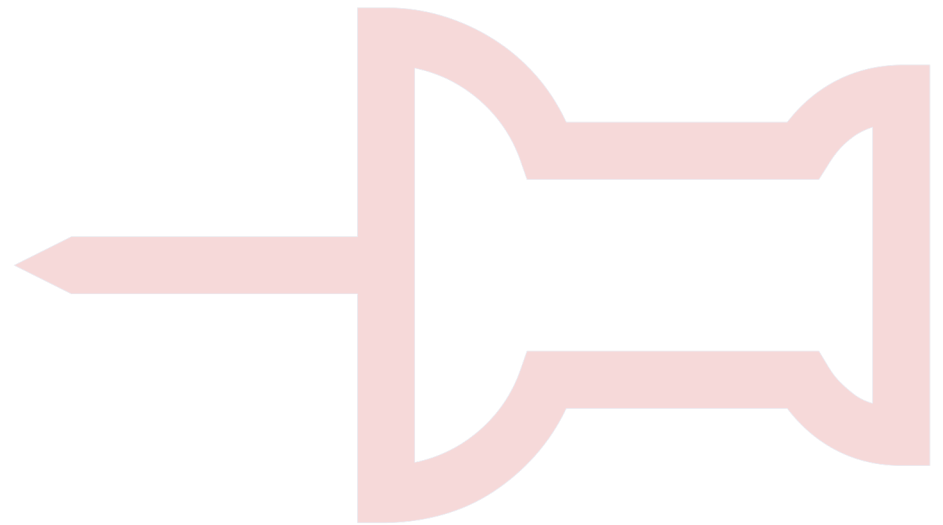 4 digits **VS** 8+ characters

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Contributions

Understand

- *why* users reuse their PIN numbers
- *where* they reuse their PIN numbers
- *which* inspirations they use to create their PINs

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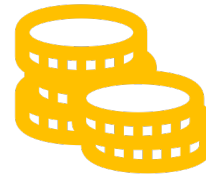University

MTurk Recruitment

150 participants
(2 were removed)

95% HIT approval rating

Located in the US

≥ 18 years old

$1.25 upon completion

Median completion time
of 5mins. and 13secs.

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MTurk Survey

- **Current use**
  - **Usage scenarios:** credit/debit card, cell phone, safe, banking, …

- **Risk**
  - **Value groups:** which scenarios do users value the most?

- **Reuse**
  - **Two types:** exact VS partial
  - **Reason**

- **Inspirations**

- **Demographics**

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PIN Reuse

Users reuse PINs across all scenarios

Scenario	Exact reuse	Partial reuse	% Participants
Home entry	30%	15%	22%
Luggage	46%	46%	9%
Banking (online/phone)	48%	20%	57%
Debit/credit cards	52%	22%	89%
Safe	54%	31%	19%
Laptop	55%	23%	55%
Online account secure pin	58%	29%	36%
Cell phone	60%	26%	77%
Gym locker	67%	42%	8%
Voicemail	67%	15%	37%
Sim cards	73%	47%	10%
Lock box	78%	33%	6%
Bike lock	79%	29%	9%

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Which Scenarios do Users Value the Most?

Scenario Value group threshold	Physical 2.64	Financial 3.76	Emotional 3.69
Voicemail	1.64 ± 1.08	1.87 ± 1.28	3.22 ± 1.50
Gym locker	2.17 ± 1.11	2.67 ± 1.44	2.92 ± 1.44
Luggage	**2.69 ± 1.60**	2.69 ± 1.49	3.62 ± 1.56
Bike lock	**3.00 ± 1.52**	3.14 ± 1.56	3.64 ± 1.39
Cell phone	2.51 ± 1.47	3.64 ± 1.26	**3.99 ± 1.19**
Home entry	**4.48 ± 0.91**	3.73 ± 1.13	**3.94 ± 1.41**
Lock box	**3.22 ± 1.64**	**3.78 ± 1.48**	**3.89 ± 1.17**
Sim cards	**3.53 ± 1.06**	**3.87 ± 1.13**	3.60 ± 0.83
Laptop	**2.95 ± 1.62**	**3.90 ± 1.11**	**4.21 ± 1.04**
Safe	**3.36 ± 1.47**	**4.25 ± 0.93**	**4.14 ± 1.11**
Online account secure PIN	2.49 ± 1.64	**4.30 ± 0.95**	**3.79 ± 1.38**
Banking (online/phone)	2.59 ± 1.48	**4.49 ± 0.92**	3.54 ± 1.56
Debit/credit cards	2.55 ± 1.55	**4.52 ± 0.92**	**3.74 ± 1.36**

For each scenario, if my PIN was discovered by an attacker, I am at serious risk of:

- **physical** harm
- **financial** harm
- **emotional** harm

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Easier to Remember 55%

"I reuse pins because its easier to remember and they have worked well for me."

"Memorable and I haven't found a manager that works for me."

"What made me reuse the pin is that I was already adapted to it and its registered to my head already."

Convenience 23%

"Because I do not want to remember different PINs and/or passwords."

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PIN Inspirations

IMPORTANT

DATES

REUSING PREVIOUS

PINS

RANDOM

NUMBERS

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Future Work

No PIN reuse VS PIN reuse for unrelated scenarios

- Guidelines for "acceptable" PIN reuse
- Study of the likelihood of successful stealing attacks in each reuse case

PIN inspirations across cultures

- How does each culture affect the creation patterns of PINs?
- How do PIN inspirations change across cultures?

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Key Take-Aways

Why do users reuse their PIN numbers?

- Easier to remember, convenience

Where do users reuse their PIN numbers?

- Everywhere: across high and low valued scenarios

Which inspirations do users use to create their PINs?

- Important dates, previous PINs and random numbers

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https://wayworkshop.org/2020/papers/way2020-casimiro.html

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