

ActivPass: Your Daily Activity is Your Password

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1 Background and Motivation

2 ActivPass System

3 Experiment Setup

4 Results

5 Key Points

Password sharing becomes a habit

The screenshot shows a news article from CNET. The header includes the CNET logo, a search bar, and navigation links for Reviews, News, Video, and Help. The main headline reads "Netflix CEO: Curse you, password sharing! Literally". Below the headline is a sub-headline: "On what's typically a snoozy earnings discussion, Reed Hastings shares what he claims is the log-in info for the head of rival HBO. And the password would make your grandma gasp." A cursor arrow points towards the end of the second sentence.

CNET Internet › Netflix CEO: Curse you, password sharing! Literally

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Background and Motivation: Issue of Password Sharing

Effect of sharing



NEWS FROM THE ATLANTIC

APR 22, 2013 12:35PM ET

10 Million People Watch Netflix Without Paying

REBECCA GREENFIELD



Background and Motivation: Issue of Password Sharing

Service providers lose revenue

Analyst: Netflix could boost revenue by cracking down on password sharing

Technology • July 25, 2014 9:04PM

 FOLLOW STORY



Background and Motivation: Existing Solutions

Existing solutions



Biometric based and hardware based solution are not applicable in every scenario

Background and Motivation: Existing Solutions

OTP: another promising solution

- A random string
- Does not carry any private information



Background and Motivation: Opportunity

Daily activity



We do a lot of activities in our daily life and they are **dynamic** in nature

Background and Motivation: Opportunity

Some of these activities are

- capture-able hence verifiable
- carry private information hence we do not want to share



Got a personal message



Speaking over phone



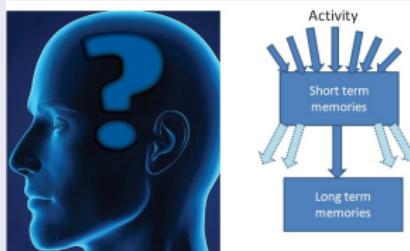
Chatting with friend



Surfing some page

Background and Motivation: Key Intuitions

We can remember our recent past activities



It is difficult to guess other's activities



Could not guess who
she is talking with



Talking with someone

1 Background and Motivation

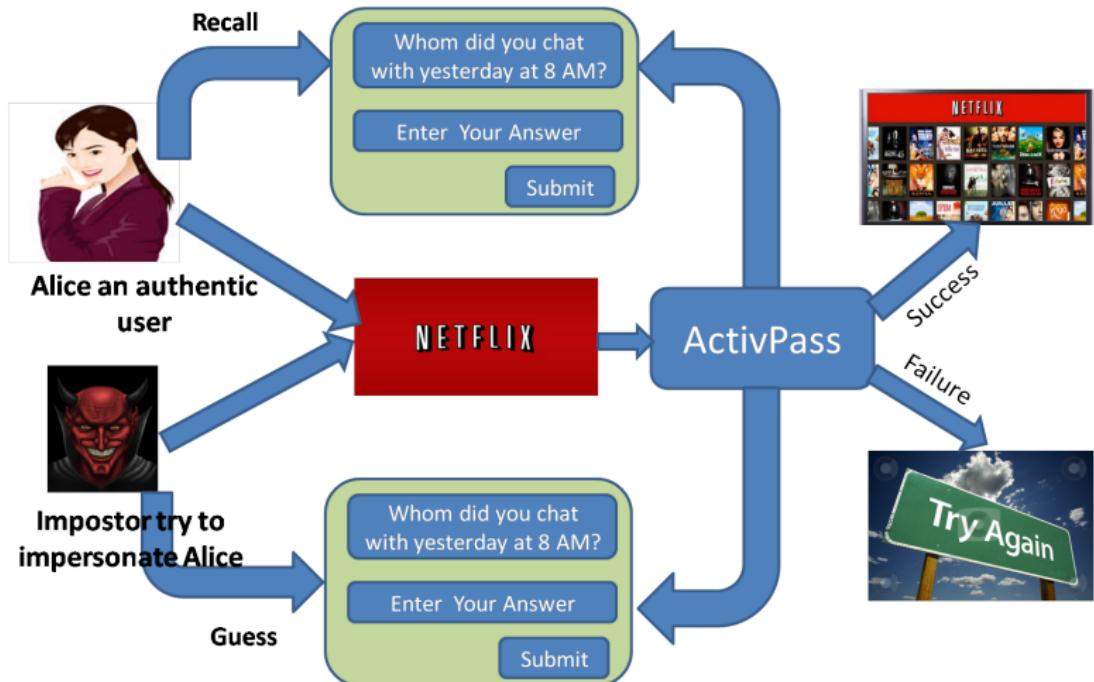
2 ActivPass System

3 Experiment Setup

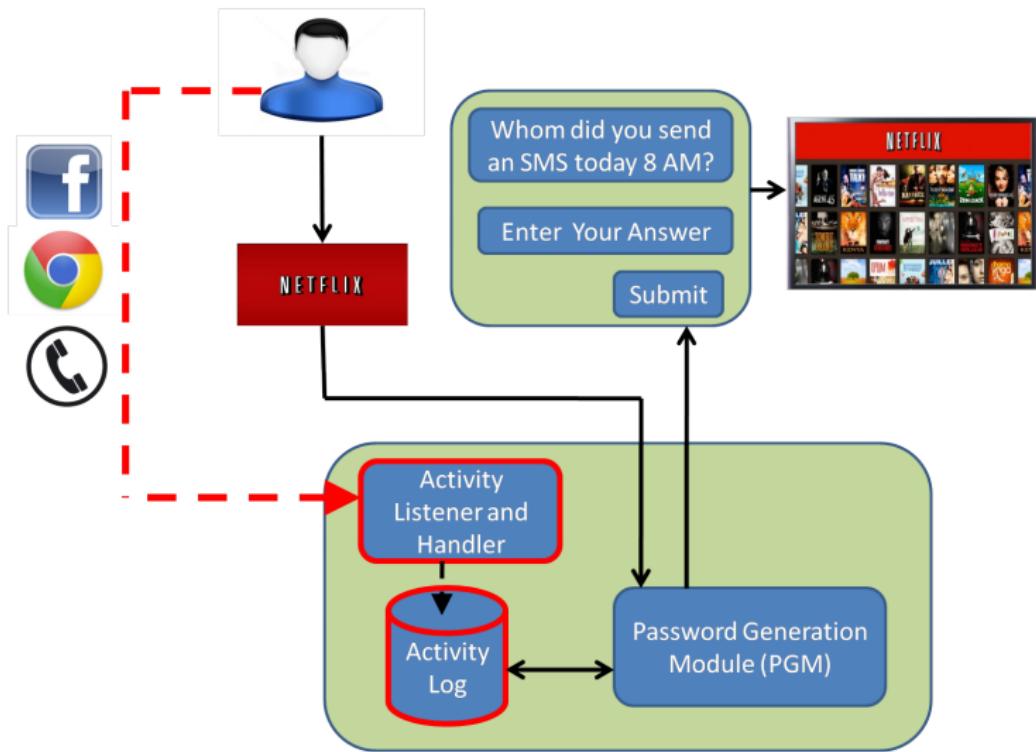
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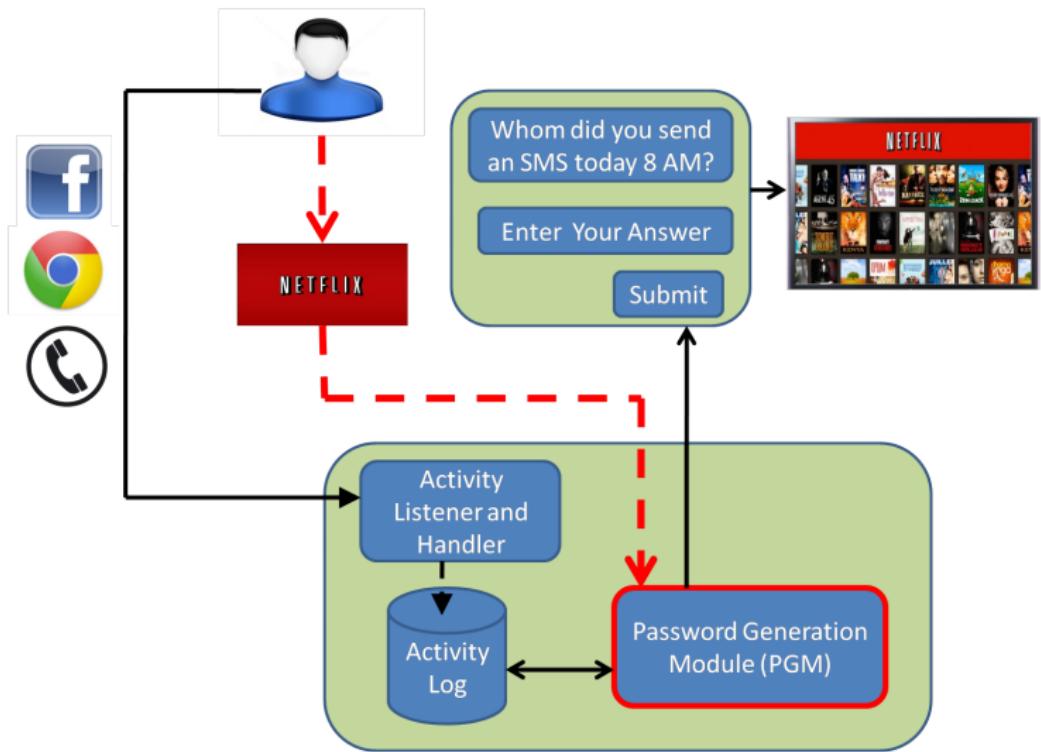
ActivPass System: Overview



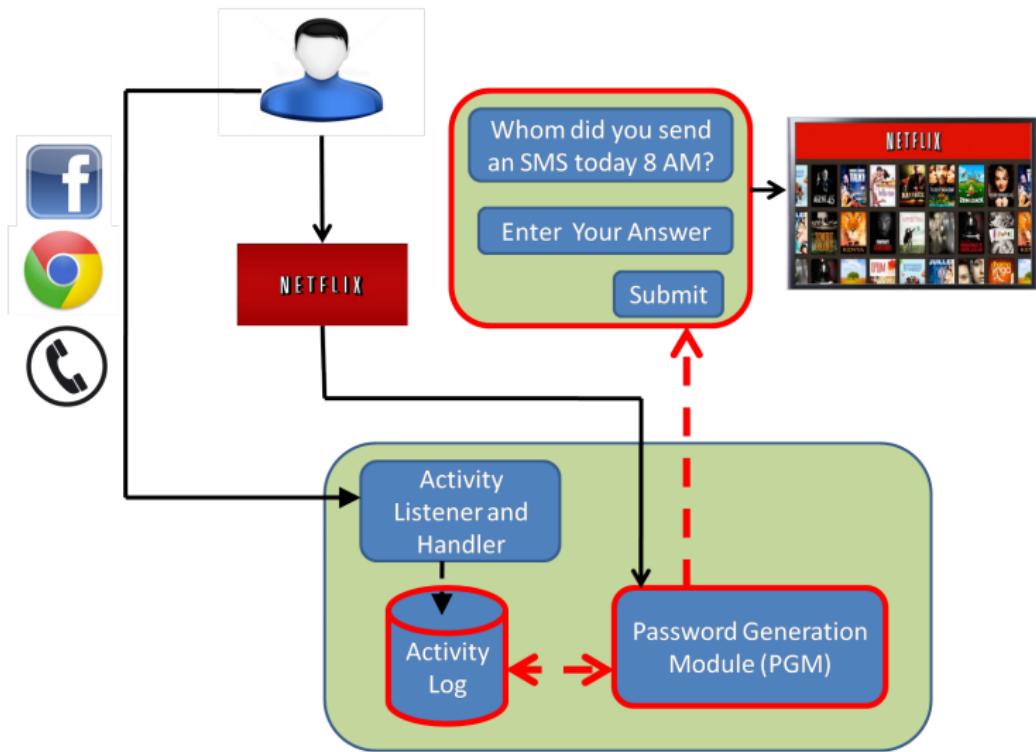
ActivPass System: Working Principle



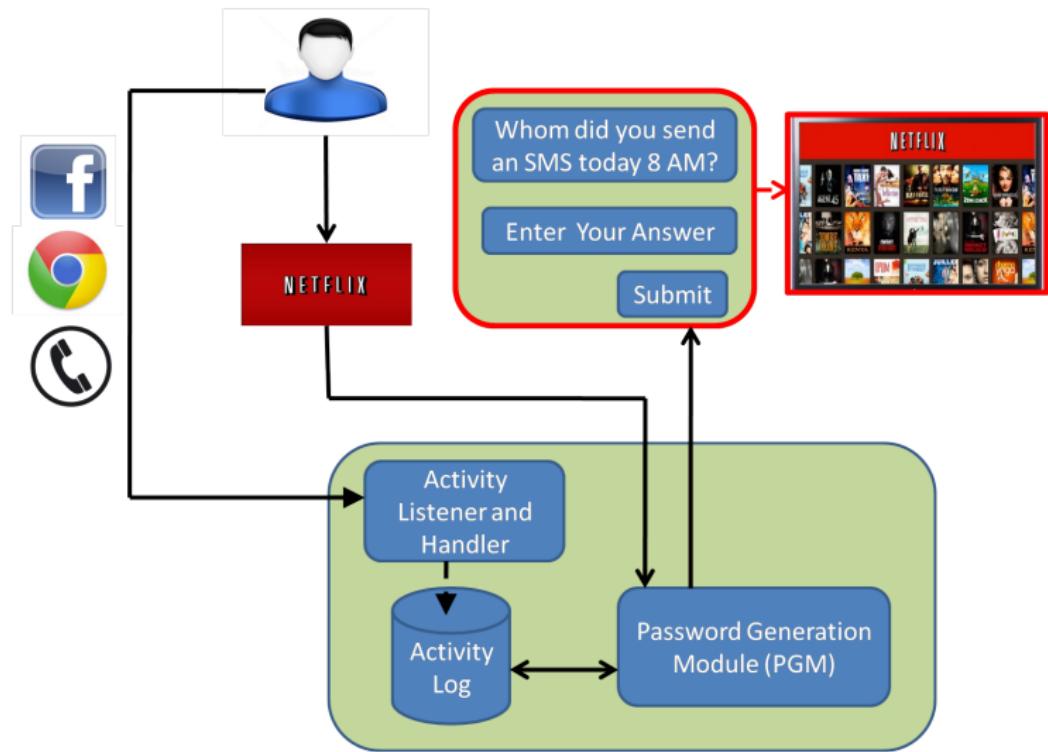
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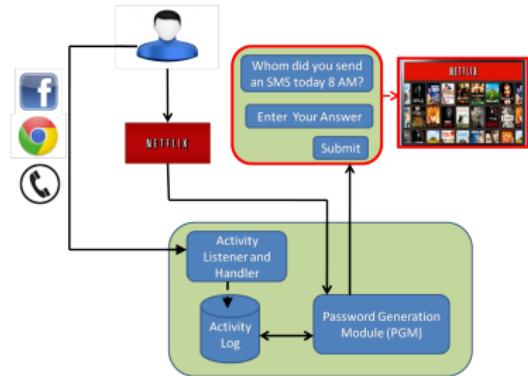
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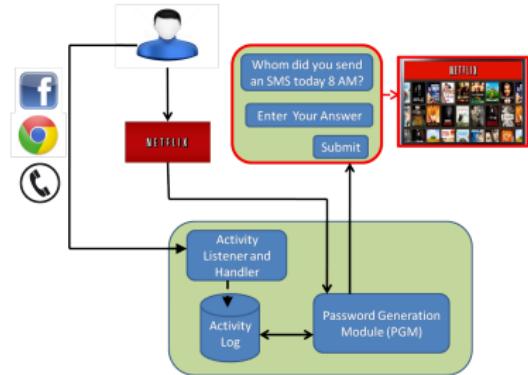


ActivPass System: Design



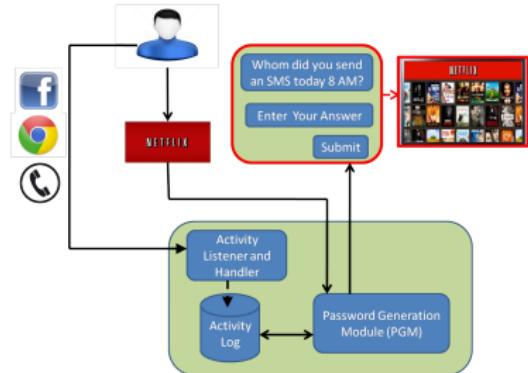
- **Which activity should be chosen for challenge generation?**
- How the challenge should be formed from chosen activity?
- Is a single challenge sufficient for authentication?

ActivPass System: Design



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Experiment Setup: Details of Experiment

Participant's details

- Number of Participants: 70
- Age range: 18 - 47 (median age: 26)
- Gender: 70% male and 30% female
- Profession: students, researchers, faculty, office staff

Activity sources

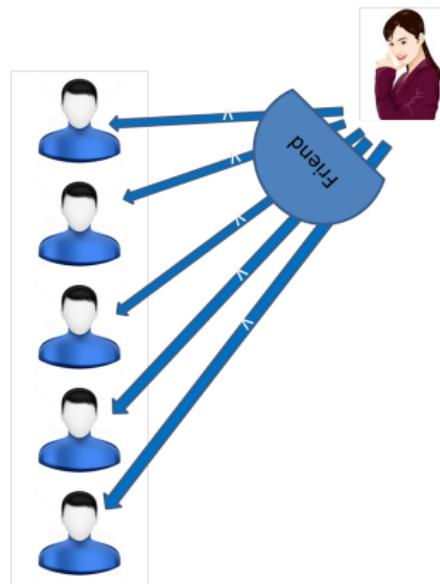
- 1) Mobile activities (call, SMS, audio)
- 2) Facebook (group, pages, chat-friend)
- 3) Browsing history

Question formats

- 1) MCQ
- 2) Binary questions (yes/no)
- 3) Text based questions

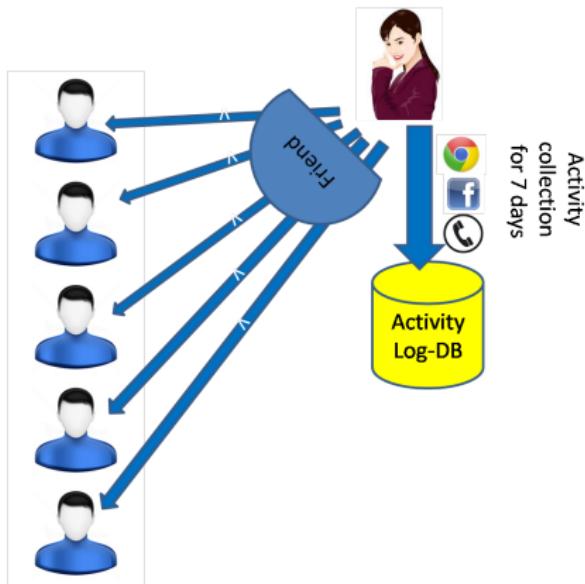
Experiment Setup: Experiment Procedure

- Identify friends
- Collect activities
- Generate challenges
- Test recall and guess



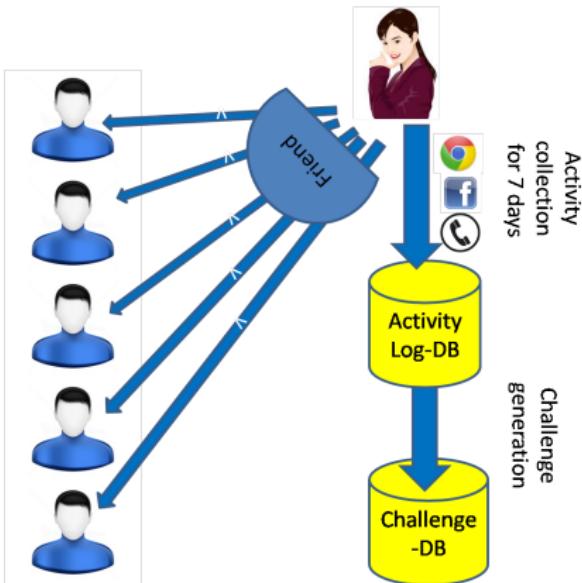
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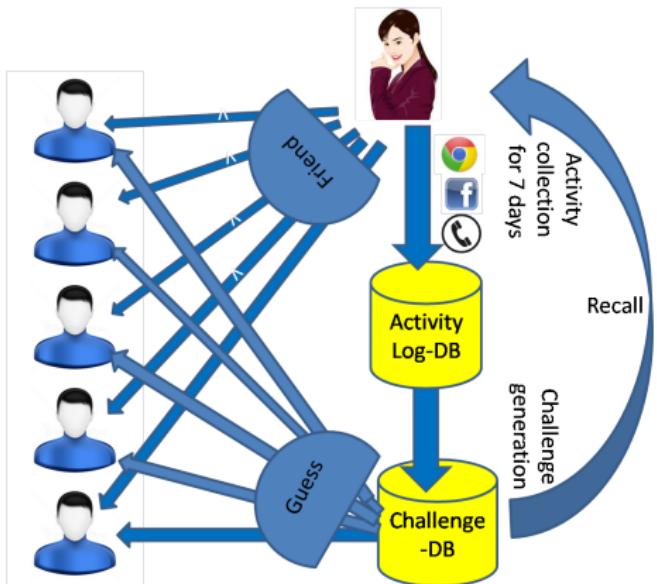
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Results: Metric

Metrics

Recall Rate (RR): It is percentage of correct recall made by Alice about her own activity.

Guessability (G) : It is percentage of correct guess made by Alice's friends about Alice's activity.

Results: Insights

Which activity should be chosen for challenge generation?

Non-outlier activities

Whom did you send an SMS at 8.30 am today? A) friend1 B) friend2 C) friend3
D) **girlfriend**



- Frequent activities are easy to guess
- High guessability ⇒ discard frequent activities

Not so recent activities

Whom did you chat with **six days ago** at 6.30 pm? [Hint: L* (* means any number of character)]



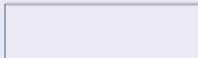
- Not so recent activities are hard to recall
- Low Recall ⇒ consider last three days activities

Results: Insights

How the challenge should be formed from chosen activity?

Text based question without hint

Whom did you call at 8.30 pm yesterday?



LA* (* means any
number of character)



- Text based question without hint is hard to recall
- Low Recall Rate ⇒ discard

Binary question

Did you visit stackoverflow
today?



- Binary question is easy to guess
- High guessability ⇒ discard binary question

Result: Across all sources and all question formats

Result

Source \ Question-format	MCQ	Text-based
Source		
Facebook	93.9, 25.4	92.3, 6.5
Web	80.6, 21	N/A, N/A
Call	87.5, 23.6	90, 5.9
SMS	88, 20.8	86.2, 4.5

Results in **Blue** represents Recall Rate and **Magenta** represents Guessability

Average Recall Rate **86.3%** and average Guessability **14.6%**

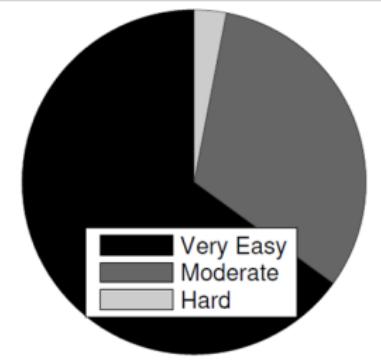
Result: Number of challenges in challenge set

Is a single challenge sufficient for authentication?

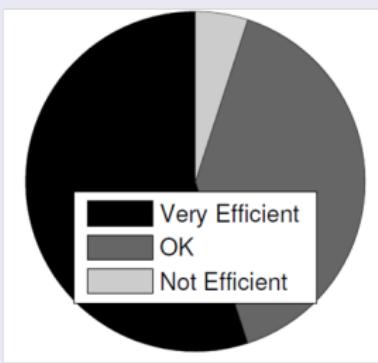
- With too many questions system will be difficult to use
- Probability that out of three questions, two questions answered correctly by **authentic user** is ≈ 0.95 and by **impostor** is ≈ 0.05
- Final results confirms the computed probability

Result: User Study

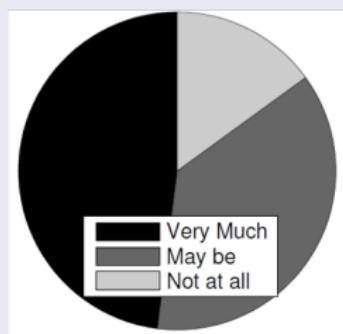
User Study



Easy to learn



Memory wise effortless



Replace question answer
based password recovery

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Key Points

- Recent past outlier activities are good candidate for challenge generation
- This type of password system can restrict password sharing and can be used for password recovery
- There is scope of further improvement in challenge generation through personalization

Thank You!!

Thanks to **Google India** for awarding me travel grant for this event.