Using the Safe PassTracker to Analyze Password Usage

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Introduction/Background

In an ever evolving age of technology, a need for increased user security and safety grows nearly as fast as technology itself. However, as browsing the internet has become a prevailing part of nearly all of our lives, almost all people have extraneous accounts and passwords opening themselves up to security threats. Dr. Jelena Mirkovic and Dr. Genevieve Bartlett have studied how passwords are used and how authentication systems impact cyber attacks. To better understand how passwords are used, I examined much prior research, some conducted by our professors, and came to the following hypotheses:

1. Many people have far more accounts that they use
2. These accounts quite frequently use the same or highly similar passwords as passwords used on more important accounts
3. Using the same password throughout many accounts increases risk of attack. This risk could be reduced if we could identify non-essential reuse.

Objective & Impact of Professor's Research

With this background work in mind, our lab began to build a Chrome extension and a data-mining software to monitor and analyze how the user employs passwords. In attempting to make the users passwords more secure, we developed the following goals:

1. To begin with a summary of all the passwords the user has previously used and their habits.
2. To build a Chrome extension that monitors the password use of the user.
3. To give the user a detailed report of their password usage and suggestions on how to improve.

Our goal was to help decrease the risk of cyber attack in all users of the Safe Passtracker 10000^{Tm*}.

Results/Conclusion

Results: We tested the Safe Passtracker 10000^{Tm} on four separate sets of data, contributed by us or our collaborators, to confirm our hypotheses. These data are the number of accounts opened, passwords reused, and number of unique passwords. For security reasons, each user will be referred to as number one through four.

Subject	Open Accounts	# of Unique Passwords	# of password repeats	Percentage of accounts with same password
Subject 1	92	17	49	53%
Subject 2	267	43	150	56%
Subject 3				
Subject 4				

Conclusions: Our hypotheses proved true. We found that

1. All users surveyed had far more accounts than they use on a regular basis
2. A staggering amount of these accounts use the same passwords.

It is essential that as password use increases, we are cautious with this critical information. We hope that the Safe Passtracker 10000^{TM*} is a step in that direction for many users.

Skills Gained/ How This Relates to Your STEM Coursework

Acquired Skills:

I have improved my knowledge of Java

I have learned the following programming languages:

Minor Objective C

Javascript

Python

JSON

I further learned using

Matlab

GitHub

And the open source program Hindsight

```
window.onload = function(){
 chrome.extension.onMessage.addListener(function(msg, sender, sendResponse) {
   console.log(msg);
   //alert("You have used this password " + msg +" times.")
 });
}

window.onbeforeunload = function(){
  if(n>2)
  {
  var salt = "156";
  var key = CryptoJS.PBKDF2(activePassword, salt, { keySize: 128/32 });
  chrome.storage.local.set({"Url": url}, function(){});
  chrome.storage.local.set({"Password": key}, function(){});
  chrome.runtime.sendMessage({content: key, type: "m1"});

  chrome.runtime.sendMessage({content: url, type: "m2"});
   console.log(key);
  }
}
});
```

A small code sample from the Safe PassTracker 10000^{tm*}

How this relates to course work:

Whether or not we accept it, computer science is becoming an instrumental part of each and every one of our lives. From running complex physics calculations to simulating the tiniest of chemical reactions, computer science and programming is a part of every stem field. Further, programming embeds critical thinking skills, objective based thinking, and the ability to think of creative solutions that many would miss.

Next Steps for You OR Advice for Future SHINE Students

Recommendation to other SHINE students in the future:

- Make the most of your time in the lab, it goes by very quickly
- Don't be afraid to ask for help from anyone in the lab
- Interact as much as possible with other SHINE students, it's not too common to be surrounded by people who love science as much as you do.
- Do not tunnel-vision on one objective, absorb and learn as much as you can about as many different things as you can.

My own future:

- As for me, I plan to continue programming and working in STEM fields as I transition into college.

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*This item is not actually trademarked