



SAMSUNG BEST PAPER AWARD

Congratulations to the Gold Medal Winner!
Samsung's Executive Vice President of SAIT, Dr. Chilhee Chung, awarded SRA employees, Vijay Srinivasan, Saeed Moghaddam, Abhishek Mukherji, Kiran K. Rachuri, Chenren Xu and Emmanuel Munguia Tapia with the Gold Medal for their 2014 Samsung Best Paper Award.



We would also like to recognize Jiayu Zhou for receiving the Merit Award for his participation.



The Samsung Best Paper Award (SBPA) has been sponsored by Samsung since 2004, which promotes research that helps strengthen a scientific base for Samsung's core technologies. Every year Samsung recognizes outstanding engineers and researchers who publish world-class level papers in the Samsung Innovative Technology Journal. Papers are judged on the significance of their contributions to knowledge, relevance to key issues in their technology domain, validity of results, originality of ideas, methods or applications, and quality of their presentation.

MobileMiner: Mining Frequent User Behavior Patterns on Mobile Devices

			<p>45 hours idle time per week on average</p>
<p>PERSONAL DATA PRIVACY</p>	<p>REGIONS WITH NO CLOUD OR NETWORK ACCESS</p>	<p>POWERFUL PHONE PROCESSORS</p>	<p>LENGTHY PHONE IDLE TIMES</p>

Q&A with Vijay Srinivasan

What is your main focus here at Samsung Research America?

Our group is part of the Advanced Software Platforms Lab (ASPL) and is mainly focused on researching and developing software systems that use device sensing, machine learning, and data mining for recognizing the user's current context, mining their typical behavior patterns, and predicting their future behavior. Our software solutions can be deployed on the mobile device or cloud and can ultimately be used in diverse application domains such as health analytics, education, or improving mobile user experience.

The title of your paper is *MobileMiner: Mining Frequent User Behavior Patterns on Mobile Devices*. Could you tell us about the type of research that was done in order to create your proposed solution?

We observed that most existing research focuses on recognizing the user's current behavior using the mobile device, such as their current physical activity, place, or app usage. However, in this work, we wanted to research the potential of being able to discover frequent behavior patterns from long term behavior logs already recorded on your phone or tablet. One simple example of a frequent behavior pattern is that whenever I am at home on Sunday nights, I call my parents.

What are the core innovations in your work?

In this work, we researched and developed the MobileMiner system to discover frequent user behavior patterns from long term behavior logs recorded on the phone. Our MobileMiner software runs entirely on the phone without relying on cloud support for computation. A key insight is to compress the mobile behavior data and mine patterns over the compressed data to reduce the time taken for mining. Another core innovation is to provide tools to users and developers to explore patterns of interest to them in a short time. A key innovation of our work is to actually use the discovered patterns to predict the future behavior of the user such as the next app the user launches. We also explored how to extract common group patterns in the paper. Finally, we thoroughly evaluated our mining and prediction algorithms with mobile context data collected from 106 mobile users that we recruited.

Why Mine patterns on the mobile device as opposed to the cloud?

One reason is to protect personal data privacy; this is a key differentiator from our competitors who typically store your personal behavior data in the cloud for pattern mining. Another reason is to provide intelligence even in remote or developing regions where cloud or network connectivity may be absent. Finally, modern smartphones and tablets have powerful processors that are often idle and can be used for the mining computation. For example, when you are sleeping at night, MobileMiner could run on your idle smartphone to mine your personal patterns.

What are the key benefits for users?

By using MobileMiner to predict the user's next action on the phone, we can provide a more intuitive UI that requires less effort from the user to find the app or contact the user needs from the phone. We can also preload applications to reduce loading delays; for example, your phone could preload Angry Birds at the right time based on your playing patterns so that you can start playing it instantly instead of waiting for it to load. MobileMiner can also be used to automate frequent user actions such as turning on Wi-Fi when you go home at night, provide smart reminders for power management and phone charging, or even be used to recommend and schedule group activities based on common patterns of groups of friends.

What kind of feedback has your App prediction service received?

Yes, we built an app prediction service that predicts the next app the user might launch and shows shortcut icons for the apps on the quick panel. Based on 42 external users surveyed, we found that they really liked the service and would use it on a daily basis. Also, the users had different preferences for how often they would like app suggestions, how accurate the app suggestions should be, and how many app suggestions should be shown. Our MobileMiner system is configurable to address these different preferences of individual users.

What's next, from a paper/thought/new-initiatives perspective?

In the future, our team is planning on working toward hybrid systems that combine device-based intelligence with cloud-based data mining and deep learning for applications in diverse domains such as health, education, and personal analytics. As an immediate next step for MobileMiner, we are interested in exploring different types of user behavior patterns such as sequential patterns or causal patterns, and how these patterns can further improve mobile user experience.

What advice do you have for other researchers who hope to produce award-winning papers?

My advice is simply to follow the SBPA guidelines and prepare a high quality submission that has several novel research contributions and is also comprehensively evaluated with empirical evidence. My impression is that SBPA has the same reviewing standards as getting a best paper award from the top-tier research conference in your field of research. Personally, for us, we went through the rigors of publishing our MobileMiner work as a full paper with the best paper nominee award in the premier ACM Ubicomp 2014 conference, which really helped us bring the paper to a great shape in time for SBPA 2014.