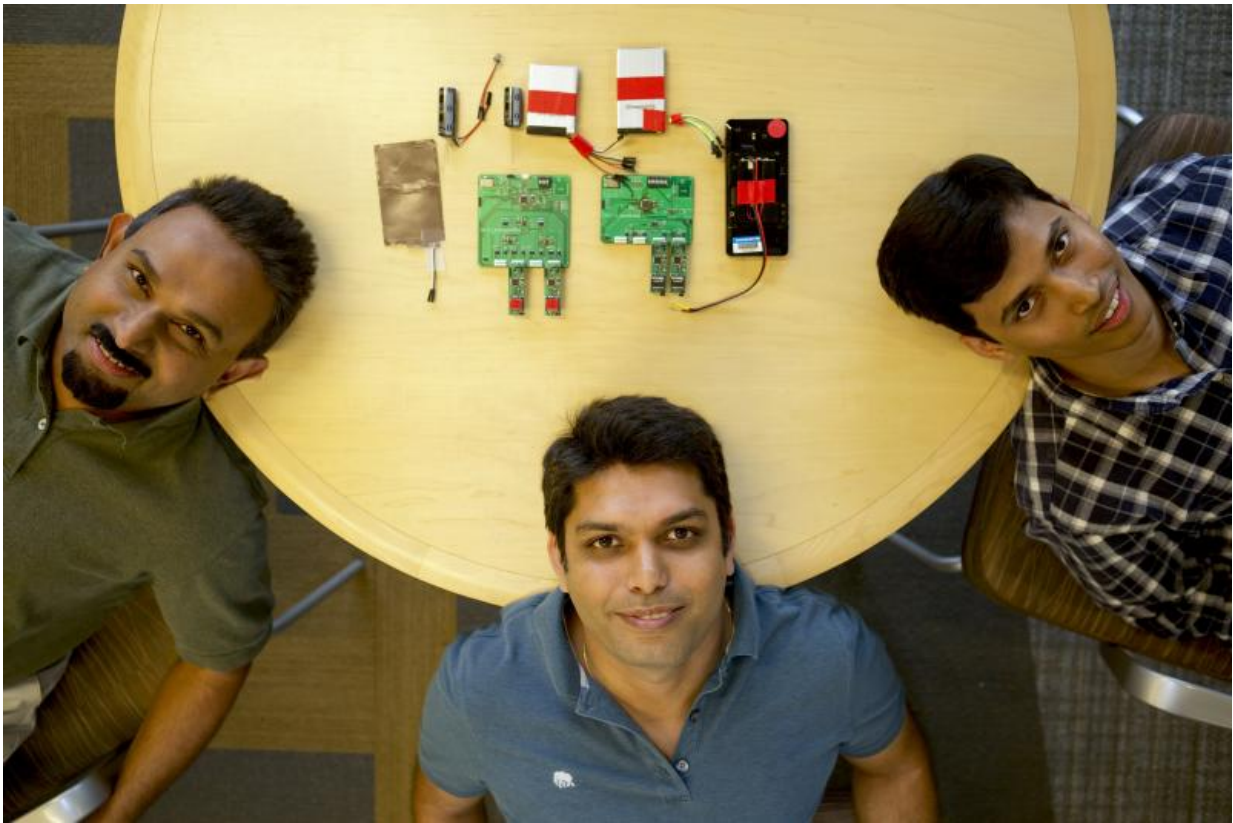# A laptop battery system that knows your habits and lasts a lot longer

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Microsoft researchers Bodhi Priyantha, Ranveer Chandra and Anirudh Badam are among the researchers who worked on the new approach to extending gadget battery life. Credit: Jeremy Mashburn/Microsoft.

Engineers have spent decades trying to build a significantly better battery

for laptop and tablet computers.

A new Microsoft research project suggests a radical alternative: Why don't we build a better computer?

Microsoft researchers, working with colleagues from academia, have come up with a system that uses multiple kinds of existing batteries, working in tandem with smarter software, to keep laptops and tablets charged much longer than current standards.

"Rather than waiting for the perfect battery, we're using all the technology available right now," said Ranveer Chandra, a principal researcher at Microsoft Research who is somewhat obsessed with extending battery life.

The researchers will present the project, called Software Defined Batteries, at the ACM Symposium on Operating Systems Principles next week. It's still a research project for now, but they have built working prototypes and are hoping it will eventually be used in consumer products.

To understand how the system works, it helps to understand how most computers work right now.

A typical tablet or laptop computer may contain more than one of the same kind of battery, all designed to charge and power the gadget in the same way. The system for managing that charge is generally handled within the hardware itself, rather than the operating system.

Device makers have managed to squeeze a lot of battery life out of this method, but Chandra said they've still been reliant mainly on better batteries. The problem is that those battery improvements haven't kept pace with big advances in other aspects of computers and devices, such

as faster processers and better screens.

Meanwhile, people are using their devices for more and more sophisticated things. That means they need different kinds of options, like a fast charge right before a big meeting or a more heavy-duty charge that can keep a computer powered through an international flight.

"Everyone wants a better battery, and while lithium-ion is generally good, it can't meet all our wants and needs," said Julia Meinershagen, a senior engineer with Microsoft's Surface Devices who worked on this system as a side project.

The software-defined battery system takes a different approach. It combines several different kinds of batteries, all of which are optimized for different tasks, into the same computer. Then, it works with the operating system to figure out whether the user is, say, looking at Word documents or editing video footage, and applies the most efficient battery for that task.

The system also uses a technique called machine learning to learn from a user's individual habits, so it can figure out how to extend [battery life](#) based on how that person is using the device.

"Even the optimization is personalized to the users' needs," said Anirudh Badam, a researcher who worked on the project.

For example, the system may recognize that the user plugs in the tablet every day around 2:45 p.m., and then gives a long PowerPoint presentation every day at 3 p.m. That means the computer needs to be ready to do quick charge at that time, so the person can make it through that afternoon meeting.

Another user may use the computer primarily for e-mail and Word

documents during the day, then switch to surfing the web and watching videos on a train or bus commute home. Based on those habits, the computer can optimize the charge to make sure the user can do both without having to search desperately for an outlet.

As the research progresses, Chandra said he sees uses far beyond just laptops and tablets. This kind of thinking could eventually be applied to phones, cars and anything else that uses a battery, he said.

"We think we can get you the benefits of the different types of batteries that have already been invented, rather than having to keep on waiting for the ultimate battery to be invented," Chandra said.

More information: "Software defined batteries." *ACM*, dx.doi.org/10.1145/2815400.2815429

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