

MACHINE MEMORY WITH PROF XIAOCHEN GUO

TALKING POINTS

COMPREHENSION:

1. Why are caches on devices useful?
2. Why would the proportion of metadata increase when a smaller granularity is used?
3. Why do you think Xiaochen's approach requires a new programming language?
4. Why do you think electrical and computer engineering are typically more abstract than other fields of engineering (e.g. mechanical or structural engineering)?

ANALYSIS:

5. How do you think device-using habits have changed, so that updates to cache functioning are needed?
6. What are the motives behind Xiaochen's work?

APPLICATION:

7. Many device users are concerned about data privacy. How might Xiaochen's team and their collaborators account for this in their research?

EVALUATION:

8. Xiaochen mentions a new project involving living neurons. Why might neuroscience be of interest to computer engineers?

ACTIVITIES YOU CAN DO AT HOME OR IN THE CLASSROOM

There are different types of memory technologies that can store data. Consider the following table. Most of the listed memory technologies in the left-hand column are already widely used. Use the internet and your own knowledge to fill in the boxes:

MEMORY TECHNOLOGIES	HOW IT WORKS	POTENTIAL ADVANTAGES	POTENTIAL DRAWBACKS
Static random access memory (SRAM), typically used in cache			
Dynamic random access memory (DRAM) typically used in main memory			
NAND Flash, typically used in storage and USB drive			►RS/B11 ►RS/B11
Hard disk drive (HDD), used as storage			►RS/B211K 7N ►RS/B211K
3D XPoint memory, can be used as main memory or storage			

MORE RESOURCES

- This article from Lehigh University talks further about Xiaochen's research and provides related links: <https://engineering.lehigh.edu/news/article/nsf-career-award-supports-lehigh-research-improve-computational-memory-systems>
- This TED-Ed video gives an engaging overview of how computer memory works: <https://www.youtube.com/watch?v=p3q5zWCw8J4>
- Xiaochen recommends learning to code. This article highlights over 80 resources to learn how to code for free: <https://skillcrush.com/blog/64-online-resources-to-learn-to-code-for-free/>