Overcoming the Challenges of Speech Interaction for Low-Power Devices
“A guy walks into a bar…”

A guy walks into a car dealership…

“I want a car that can pull my boat.”

“and I’d like it to get over 40 MPG.”

“and I need it to cost under $20,000.”
The Evolution of Voice on Ultra-Low Power Devices

- **$600 ASP**
  - 3000 mAh battery
  - 3000 MIPS
  - 2000 KB RAM

- **$250 ASP**
  - 300 mAh battery
  - 2000 MIPS
  - 500 KB RAM

- **$100 ASP**
  - 200 mAh battery
  - 200 MIPS
  - 250 KB RAM

- **$1400 ASP**
  - 90 mAh battery
  - 50 MIPS
  - 15 KB RAM
The Evolution of Voice on Ultra-Low Power Devices

- Lower ASPs
- Smaller batteries
- More constrained hardware & user interfaces
- Conflicting design constraints
Operational Challenges

- Speech is not the primary purpose of the device
- Design not optimized for speech use cases
- Single mic devices more common
- Far-field & off-axis orientations more common
Competing Constraints

- Price constraints imposed by BOM ceilings
- Power constraints imposed by battery size & life expectations
- Performance constraints imposed by use cases, industrial design & user expectations
Three Axes of Optimization

- Memory equates to cost
  - Smaller memory size means software can execute on cheaper processors
  - Can be achieved at the expense of MIPS

- MIPS equates to power
  - Lower MIPS means software consumes less power
  - Can be achieved at the expense of memory

- Algorithm sophistication equates to performance
  - Scalable performance can be achieved at the expense of MIPS and memory
Thank You

Malaspina Labs
Voice communications & speech interfaces for ultra-low power devices
Focus on small footprint implementations for use in noisy environments