Motivation: variation in power consumption
• Atmel ARM SAM3U: 9x variation in sleep current across instances
• 4x variation in sleep current for a single instance across 20 – 60°C
• 5% variation in active current at room temperature across instances
• 40% variation in active current for a single instance across -50 – 150°C

Embedded Sensor Software
• Typically duty cycled: sleep for most of the time, wakeup to sample
• Duty cycle is constrained by sensor power and lifetime requirements
• More active time: more samples, better quality of sensing
• With power variation, duty cycle must be tailored to each sensor

Variability-Aware Duty Cycle
• Sleep and active power curves are characterized for each sensor
• Duty cycle is determined for each sensor
  according to required lifetime, temperature profile
• Software stack with Adaptable Tasks in TinyOS:
  scheduler changes period or number of iterations for tasks
  according to allowable duty cycle for sensor

Variability-Aware Duty Cycling Results
• DC based on datasheet spec: doesn’t meet expected lifetime
• DC based on worst-case power: low quality, leaves battery untapped
• Variability-Aware: highest quality that meets lifetime requirement: 3-22x improvement over worst case across temperature profiles
• 50% Improvement in inference quality for target localization