A Multidisciplinary Pilot Course on the Internet of Things (IoT): Curriculum Development Using Lean Startup Principles

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Introduction

• What is IoT?
• Large Growth
• Challenges
IoT Course

- project-based
- Pilot
- 8 students
- Just-in-time problem-based learning
- Student Recreation Center Treadmills
Course Challenges

• When? Where? Context?
• Multidisciplinary
• Breadth versus depth
• Requires a holistic view
• Varied implementations
• No standard learning objectives or course outcomes
Lean Startup

- Weeks from inception to deployment
- Students involved in early stage
- Just In Time teaching
- Minimum Viable Product (MVP)
Pilot Course

- Course content versus student learning
- Top-down, linear versus dynamic and unstructured
- More creative
- Make connections
- Ask more questions
Pilot Course

- Off the shelf hardware
- Multidisciplinary
- Novel content
- Machine learning
- Distributed computing
- Multiple sensor
- Sensor to sensor communication
- Single project
Project Characteristics

- Wireless transfer of data
- Limited power
- Large amounts of data
- Machine Learning
- Feature Selection
- Signal Processing
- Distributed Information
Project

• Put Shimmer 3 IMU sensors with gyroscope on treadmills
• 4 mtgs per week
• Hardware (ECE)
  – Radio communication
  – Compressed sensing
• Software (Math, CS)
  – Bluetooth communication
  – Machine Learning
Results

- Data features – mean, maximum, standard deviation of accelerometer, magnetometer, frequency and power spectra
- Created machine learning classifiers
- Used cross-validation
- Able to classify treadmill activity as no activity, running or walking at 98% positive rate
- This was done in real time on the treadmill
Challenges

• Importance of Power consumption
• Challenging creating a ground truth data set
• Danger of overfitting data
• Assessing technical mastery may be difficult
Conclusions

• Team teaching greatly reduced course burden
• Create more strategic framework for expectations
• Submit weekly progress memos
• Time log of activities
• Literature review
• Documentation of team communications
• Add data and device security
• Invited lectures
• Voice of the customer
Questions

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