LTAT.06.010 Pervasive Data Science

Lecture 1

Mohan Liyanage, PhD; Huber Flores, PhD

DISTRIBUTED AND PERVASIVE SYSTEMS

Tartu, Estonia 07/02/2022
Overview

• Pass/Fail course
• Lectures will be in person (unless agreed otherwise)
Overview

**Goal:** To obtain a general idea of pervasive data science by developing a topic of your interest. The topic will be developed incrementally throughout the course. Thus, there will be intermediate presentations and checking points.

**Result:** After taking this course, you will have acquired new skills for data sampling and data analysis.

**Deliverables:** It depends on the project chosen. The deliverable can be a user study, a review or a Jupiter notebook. This is agreed with the lecturer during the seminar.
Research

Distributed systems
Research

Mobile and pervasive systems
Research agenda

Distributed Systems

Mobile and Pervasive computing

Our expertise

Examples

Drink (liquid) identification

Energy management

Health indicators
More examples

- Energy management
- Psychology
- Liquid recognition
- Material identification
- Drones for air quality
Example 1: Aquatic plastic pollution

Objective: To identify plastics underwater.

Source: https://www.pinterest.com/pin/484840716132563124/
Example 1: Aquatic plastic pollution

**Objective:** To identify plastics underwater.

<table>
<thead>
<tr>
<th>Test</th>
<th>k-NN</th>
<th>Random forest</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cross Validation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All conditions 6-folds</td>
<td>0.95</td>
<td>0.95</td>
<td>0.95</td>
</tr>
<tr>
<td>Ambient 6-folds</td>
<td>0.96</td>
<td>0.95</td>
<td>0.96</td>
</tr>
<tr>
<td>Darkness 6-folds</td>
<td>0.94</td>
<td>0.96</td>
<td>0.95</td>
</tr>
<tr>
<td>Model data → Predicted</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient → All conditions</td>
<td>0.80</td>
<td>0.80</td>
<td>0.80</td>
</tr>
<tr>
<td>Ambient → Darkness</td>
<td>0.69</td>
<td>0.68</td>
<td>0.69</td>
</tr>
<tr>
<td>Darkness → All conditions</td>
<td>0.95</td>
<td>0.95</td>
<td>0.95</td>
</tr>
<tr>
<td>Darkness → Ambient</td>
<td>0.94</td>
<td>0.92</td>
<td>0.93</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td>89.0</td>
<td>88.7</td>
<td>88.9</td>
</tr>
</tbody>
</table>

Testbed for plastic recognition underwater
Example 2: Monetary perception of battery life

Objective: To understand the value that individuals put the battery life of their devices

Example 2: Monetary perception of battery life

Objective: To understand the value that individuals put the battery life of their devices

PROJECTS
Project 1:

Objective: Understanding handgrip strength of humans using light sensors
Project 2:

Objective: Understanding typing patterns of users on mobile screens through typing sound
Project 3:

Objective: Review Explainability methods for Artificial Intelligence (AI is black-box)
Project 4:

Objective: Characterizing Drinks through WiFi analysis
Project 5:

Objective: Perception of users towards autonomous vehicles invading public spaces
**Project 6:**

**Objective:** Implement a data poisoning attack for Federated Learning.
Project 7:

Objective: Identifying devices in the network through traffic analysis

Project 8:

Objective: Review about why digital contact tracing failed in pandemic times

Source: https://www.cochrane.org/news/featured-review-digital-contact-tracing-technologies-epidemics-rapid-review
Project 9:

Objective: User perception of litter classification using sensors

Source: https://www.vectorstock.com/royalty-free-vector/waste-recycling-concept-vector-31773935
Project 10:

Objective: Nutritional value of fruits and vegetables
Take away

- Choose a topic
- Send me the topic title via Slack Message Board (Accessible from the course webpage)
Next lecture

Lecture 2: Revisiting available projects
Questions?

E-mail: huber.flores@ut.ee