ISSM Day3 Pre-class Worksheet

[Instructions: Please provide your answers in the cells shaded in white color.]

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| Your name: |
| Q1. Have you download and look through the ISSM day3 course materials from LumiNUS? |
| Please refer to the title of Slide 20 of ‘3.2 Intelligent sensor processing using machine learning (2) v2.7.pdf’, and fill in the blank “**Case 4:** Anomaly Detection”. |
| Q2.  According to the news published in Straits Times [1] on 17 June, 2021, NUS will pilot SP Group's digital energy solutions to improve energy efficiency standards at two buildings. The portal has two key features - advanced *data analytics* and an *anomaly detection* function. The data analytics feature provides recommendations on saving energy. The artificial intelligence-enabled anomaly detection function helps prevent utilities wastage.  Anomaly detection refers to identification of items or events that do not conform to an expected pattern or to other items in a dataset that are usually undetectable by a human expert. There are three types of anomalies in data analytics [2].   * Type 1: Point anomaly: A data point is considered a global outlier if its value is far outside the entirety of the data set in which it is found. * Type 2: Contextual anomaly: A data point is considered a contextual outlier if its value significantly deviates from the rest the data points in the same context. * Type 3: Collective anomaly: A subset of data points within a data set is considered anomalous if those values as a collection deviate significantly from the entire data set, but the values of the individual data points are not themselves anomalous in either a contextual or global sense.   Further readings  [1]. NUS to pilot SP Group's digital energy solutions, https://www.straitstimes.com/tech/tech-news/nus-to-pilot-sp-groups-digital-energy-solutions, 17 June, 2021.  [2]. V. Chandola, A. Banerjee, and V. Kumar, "Anomaly detection: A survey," ACM Computing Survey Vol. 41, No. 3, Jul. 2009, available at http://cucis.ece.northwestern.edu/projects/DMS/publications/AnomalyDetection.pdf |
| Please provide an example of *Point anomaly*.  (Example: A high human temperature reading (>38').)  No. of requests sent to a website each day. Suppose usual rate is 10 requests/day and one day 100 requests are encountered by the website, then it is an anomaly (probably hacking attempt) |
| Please provide an example of *Contextual anomaly*.  (Example: Your house usually used a lot amount of electricity during the weekend in the past one year, but it spent a very small amount in last weekend.)  Pose Estimation in Human Activity Detection.   |  |  | | --- | --- | | Frame Number | Key-point 1 (x,y) - Elbow | | 1 | (0.12, 0.8) | | 2 | (0.13,0.8) | | 3 | (0.32,0.22) | | 4 | (0.15,0.8) | | 5 | (0.16,0.8) | |
| Please provide an example of *Collective anomaly*.  (Example: Most cars are moving with high speed in high expressway, while a group of car moves slowly in CBD area.)  During a terrorist attack, public is scared and moving away from the attack, while the “hero” is moving toward the attack to kill the terrorists. “hero” is an anomaly. |