Final Exam CS 598tar

Please read carefully: Answers to this exam are due by email by Saturday, May 12th, 11:59pm Central time. Please send answers only in plain text in the body of the email. Do not send attachments. Please adhere strictly to the format below, as exam may be auto-graded:

- Subject line: “CS598TAR EXAM” (all in upper case letters).
- First line of the email: Your full name.
- Subsequent lines: One answer per line in the format: “Q#” (where # is the question number) followed by “.” followed by the letter indicating the answer choice made (in uppercase letters). For example:
  
  Q1. A
  Q2. C
  ...

Please answer the multiple choice questions below by choosing the best statement to characterize the contribution of each paper in question, among the choices provided. Note that, multiple choices might apply partially to different degrees. Please indicate the best choice according to your understanding of the true contribution of each paper. Note that, the papers are cited by numbers. Please refer to the reference list at the end of his exam to see the full citations that the numbers refer to.

Q1. “Can Instagram posts help characterize urban micro-events?” [34]
   (a) Is the first paper to use Instagram for urban event detection.
   (b) Improved urban event detection in Instagram by removing false positives.
   (c) Described a solution that breaks down events into smaller stages and identifies the time and location of each stage.
   (d) Integrated Instagram and Twitter to identify urban micro-events.

   (a) Introduced the first maximum likelihood estimation algorithm for social sensing.
   (b) Developed the first maximum likelihood algorithm for jointly identifying the reliability of sources and correctness of claims for the case of non-independent sources.
   (c) Extended previous fact-finding literature from binary claims (i.e., “true/false” statements) to real-valued measurements (e.g., temperature, pressure, etc).
   (d) None of the above.

   (a) Introduced the mathematical foundations of deep learning.
   (b) Argued that deep learning systems can be implemented on mobile devices.
   (c) Described augmented reality applications for wearable devices.
   (d) Improved routing algorithms for multi-hop sensor networks in the presence of node mobility using a deep learning approach.
Q4. “Debiasing Crowdsourced Quantitative Characteristics in Local Businesses and Services” [39]
(a) Used crowdsourcing for accurate tracking of shopping carts in local businesses.
(b) Developed a maximum likelihood estimator that improves accuracy of reconstructing real-valued/integer-valued measurements from observers with measurement bias.
(c) Developed a smartphone app that reports queueing times in restaurants.
(d) Introduced a data cleaning service that separates rumors from ground truth.

Q5. “Quantifying Flexibility of Residential Thermostatically Controlled Loads for Demand Response…” [44]
(a) Studied the potential for exploiting supply-following loads to mitigate energy consumption spikes.
(b) Addressed security of smart grid applications.
(c) Introduced the new concept of demand-response.
(d) Designed a smarter thermostat for more precise temperature control in residential apartment buildings.

(a) Was the first paper to introduce the idea of subjective logic.
(b) Improved the design of subjective logic operators.
(c) Argued that subjective logic is fundamentally unsuitable for trust assessment applications.
(d) Applied subjective logic to trust assessment of Twitter feeds.

Q7. “A Survey of Incentive Mechanisms for Participatory Sensing” [49]
(a) Was the first paper to introduce the concept of participatory sensing.
(b) Was the first paper to introduce the concept of mechanism design.
(c) Was the first paper to argue for non-monetary incentives in participatory sensing applications.
(d) Presented a survey of mechanisms used to incentivize sources to collect/share information.

(a) Described a new vehicular navigation system, called GreenGPS.
(b) Developed a system for fuel savings by predicting future timing of signalized intersections.
(c) Presented design improvements and additional evaluation for GreenGPS.
(d) Extended GreenGPS to apply to autonomous cars.

Q9. “A Picture of Instagram is Worth More Than a Thousand Words” [26]
(a) Developed algorithms for detecting urban points of interest with Instagram.
(b) Developed algorithms for detecting short-term events, such as concerts, on Instagram.
(c) Developed algorithms for detecting mobile events (such as Tornadoes) on Instagram.
(d) All of the above.
   (a) Developed a fact-finding algorithm for independent sources and independent claims.
   (b) Developed a fact-finding algorithm for non-independent sources and independent claims.
   (c) Developed a fact-finding algorithm for independent sources and non-independent claims.
   (d) Developed a fact-finding algorithm for non-independent sources and non-independent claims.

Q11. “The Sound of Silence” [22]
   (a) Developed algorithms for using intervals of silence as a covert communication channel to convey encoded secrets.
   (b) Extended Shannon’s information theory to account for the fact that the length of intervals of silence can themselves be used as information signals.
   (c) Developed algorithms for detecting groups of individuals shopping together.
   (d) Developed algorithms for detecting parties of the same conversation.

   (a) Used a machine learning approach to detect whether a person is indoors or outdoors.
   (b) Used transfer learning to reduce the need for indoor/outdoor detector training and data labeling.
   (c) Exposed deficiencies of using GPS signals for purposes of indoor/outdoor detection.
   (d) All of the above.

   (a) Developed solutions for compressing deep neural networks to fit on mobile devices.
   (b) Developed a Bayesian approximation that allows estimation of uncertainty in deep learning results.
   (c) Proposed an architecture for deep learning from multiple sensor data streams.
   (d) Proposed solutions that reduce the need for labeled data for deep neural network training purposes.

Q14. “Pushing the Spatio-Temporal Resolution Limit of Urban Air Pollution Maps” [43]
   (a) Improved the design of static weather stations in a major city.
   (b) Reported experiences with using sensors in people’s homes to improve the spatio-temporal resolution of pollution measurement in a big city.
   (c) Developed statistical techniques for improving the resolution of pollution measurements in a big city using a limited number of mobile pollution sensors.
   (d) Used air pollution maps to infer the most popular tourist routes in a big city.

Q15. “Social Fusion: Integrating Twitter and Instagram for Event Monitoring” [35]
   (a) Developed algorithms for combining tweets and Instagram images that pertain to the same event.
   (b) Reduced false positives in event detection compared to Twitter-based detection algorithms.
(c) Increased the number of correctly detected events compared to Instagram-based detection algorithms.
(d) All of the above.

Please answer the multiple choice questions below by choosing the paper that best matches the contribution mentioned in the question. Note that, multiple choices might apply partially to different degrees. Please indicate the best choice according to your understanding of the true contribution of each paper. Note that, the papers are cited by numbers. Please refer to the reference list at the end of his exam to see the full citations.

Q16. A service that explains sensor anomalies by observing social media feeds:
(a) ClariSense [32].
(b) Shuochao Yao et al. [37].
(c) CityDrive [41].
(d) RDeepSense [46].

Q17. A service that advises on driving speed to minimize expected fuel consumption in view of predicted Green/Red traffic light timing at signalized intersections.
(a) ClariSense [32].
(b) Shuochao Yao et al. [37].
(c) CityDrive [41].
(d) GreenGPS [42].

Q18. An algorithm that estimates uncertainty in deep learning outputs.
(a) OverLay [17].
(b) DeepSense [45].
(c) RDeepSense [46].
(d) DeepIoT [47].

Q19. An augmented reality application that adds annotation bubbles to physical objects viewed by smart phones.
(a) SmartLight [14].
(b) OverLay [17].
(c) QueueVadis [24].
(d) GeoBurst [28].

Q20. The best example of early work on event detection using Twitter.
(a) Earthquake shakes Twitter users [25].
(b) GeoBurst [28].
(c) EvenTweet [30].
(d) ClariSense [32].
Q21. A paper that helps eliminate rumors in crowd-sensing results.
   (a) Nonverbal social sensing [19].
   (b) The sound of silence [22].
   (c) Humans as Sensors [36].
   (d) CityDrive [41].

Please answer the multiple choice questions below by choosing the paper that best helps address the problem mentioned. Note that, multiple choices might apply partially to different degrees. Please indicate the best choice according to your understanding of the true contribution of the papers on the reading list. Note that, the papers are cited by numbers. Please refer to the reference list at the end of his exam to see the full citations.

Q22. In the final battle for intergalactic peace, your acquaintance Tom (who you do not fully trust) said that his friend Gamora (who Tom does not fully trust) said that she managed to gain possession of the Infinity Gauntlet, an item of great global power. If you do not know Gamora yourself (you only had interactions with Tom, although Tom explained the history of his interactions with Gamora), which of the following papers best help you assess the likelihood that Gamora indeed has the Gauntlet?
   (a) Nonverbal Social Sensing [19].
   (b) ClariSense [32].
   (c) On Source Dependency Models for Reliable Social Sensing [37].
   (d) Subjective Logic [50].

Q23. Soon after, the Intergalactic Social Network, GalaCast, fills with posts claiming that Gamora has in fact been slain by an evil Titan. Tens of thousands of sources whose reliability you do not know report various conflicting data on the matter. Which of the following papers might best help assess the veracity of the news on this Twitter-like network?
   (a) Nonverbal Social Sensing [19].
   (b) ClariSense [32].
   (c) On Source Dependency Models for Reliable Social Sensing [37].
   (d) Subjective Logic [50].

Q24. In the meantime, pollution sensors on the remote land of Wakanda are reporting unusual concentrations of ash-like material spreading in the air. If Wakanda is covered by the Twitter-like Intergalactic Social Network, GalaCast, which of the following papers describe solution that may help collect the most pertinent (albeit unverified) information from GalaCast that might explain the unusual phenomenon? Assume that you do not know the reliability of sources.
   (a) Nonverbal Social Sensing [19].
   (b) ClariSense [32].
   (c) Pushing the Spatio-Temporal Resolution Limit of Urban Air Pollution Maps [43].
   (d) Subjective Logic [50].
Q25. Which of the following papers includes a study of behaviors that correlate with doing well on job interviews?

(a) Nonverbal Social Sensing [19].
(b) ClariSense [32].
(c) On Source Dependency Models for Reliable Social Sensing [37].
(d) Subjective Logic [50].

Q26. Your friend has a startup that sells aides for “distraction-free” learning. Specifically, your friend developed a VR headset that displays learning material (e.g., a book) while tracking the user’s gaze, and gently alerts the user when they start “drifting off” away from viewing the material. Which of the following papers would be most relevant to improving the energy efficiency of your friend’s product?

(a) SmartLight [14].
(b) Indoor Localization [15].
(c) Ultra-Low Power Gaze Tracking for Virtual Reality [18].
(d) GruMon [23].

Please answer the multiple choice questions below by picking the work that differs most from the rest. Note that, multiple choices may apply. Please choose the best one. Papers are cited by numbers. Please refer to the reference list at the end of his exam to see the full citations.

Q27. All of the papers below use accelerometers or gyroscopes, except:

(a) VibeBin [7].
(b) Toothbrushing Monitoring using Wrist Watch [10].
(c) SmartLight [14].
(d) GruMon [23].

Q28. All of the papers below use the Expectation Maximization algorithm except:

(a) On Truth Discovery in Social Sensing [27].
(b) Joint Localization of Events and Sources in Social Networks [29].
(c) Unveiling Polarization in Social Networks [38].
(d) Debiasing Crowdsourced Quantitative Characteristics in Local Businesses and Services [39].

Q29. All of the papers below are motivated, at least in part, by the goal of increasing sustainability of smart cities, except:

(a) VibeBin: A Vibration-Based Waste Bin Level Detection System [7].
(b) Ultra-Low Power Gaze Tracking for Virtual Reality [18].
(c) CityDrive: A Map-generating and Speed-optimizing Driving System [41].
(d) Quantifying Flexibility of Residential Thermostatically Controlled Loads [44].
Q30. All of the papers below envision social media as sources of information, except:

(a) Participatory sensing [1].
(b) Human-centric Sensing [5].
(c) The Age of Social Sensing [6].
(d) Humans as Sensors [36].

Good Luck.

Readings for 1/31: Urban Sensing – Exploiting the Crowd (from early visions to the present)


Readings for 2/2: Personal Sensing (Home/Indoor)


Readings for 2/7: Personal Sensing (Context Detection and Localization)


Readings for 2/9: Personal Sensing (Supporting Emerging Applications)


Readings for 2/14: Interaction Sensing (Monitoring Human Interactions)


Readings for 2/16: Group Behavior Sensing


No Readings for 2/21 and 2/23. See slides for homework instead.

Readings for 2/28: Early work on Social Media as Sensors


Readings for 3/2: Event Detection and Localization with Twitter.

28. Chao Zhang, Guanguyu Zhou, Quan Yuan, Honglei Zhuang, Yu Zheng, Lance Kaplan, Shaowen Wang, and Jiawei Han, “GeoBurst: Real-Time Local Event Detection in Geo-Tagged Tweet Streams,” In Proc. 39th International ACM SIGIR conference on Research and Development in Information Retrieval (SIGIR ’16), July 2016 *(Critique required)*


Readings for 3/7: Event Detection and Localization with Instagram.


Readings for 3/14: Veracity Analysis and Data Cleaning (Continued)


Readings for 3/16: Rise of the Internet of Things


Examples of 3/28-3/30: IoT Application Papers

41. Yiran Zhao, Yang Zhang, Tuoyu Tian, Tianyan Liu, Xinhua Tian, Xue Liu, “CityDrive: A Map-generating and Speed-optimizing Driving System,” in Proc. IEEE INFOCOM, April 2014


Spring Break (3/21-3/23)

Student-led Presentations (4/4, 4/5, 4/11, 4/13)

Papers for 4/18: Big Data Challenges


Papers for 4/20: Deep Learning Challenges


Papers for 4/25: Incentives Challenges

**Papers for 4/27: Trust and Subjective Logic**