Hemanth Kandula

CONTACT
INFORMATION

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Cambridge, MA   Google Scholar: 0lXfmjwAAAAJ

RESEARCH
INTERESTS

Machine Learning: Deep Learning, Domain adaption, Transfer learning, Unsupervised learning
Natural Language Processing: Cross-lingual information extraction and information retrieval, Authorship attribution
Computer Vision: Semantic Segmentation, Bio-medical imaging, Object Detection

EDUCATION

Tufts University, Medford, MA   Aug 2019 – May 2021

Master of Science, Computer Science

SASTRA University, Thanjavur, India.   July 2014 – July 2018

Bachelor of Technology Electronics and Communication Engineering.
Thesis: *Portable Internet-of-Things enabled rapid semen analysis system.*

WORK
EXPERIENCE

Research Engineer II, BBN - Analytics and Machine Intelligence   July 2021 – Present
Raytheon Technologies   Cambridge, MA
- ○ Engaged in cutting-edge research and development projects funded by DARPA and IARPA, primarily focusing on advancing the state of Machine Learning (ML), Natural Language Processing (NLP), and Computer Vision (CV) technologies.

  - Currently working closely with a multidisciplinary team of researchers, engineers, and domain experts on IARPA HIATUS tackling challenging Authorship Attribution tasks, leveraging advanced NLP and ML techniques.
  - Currently developing advanced semantic segmentation models leveraging deep learning and global pose estimation for accurate 3D site modeling from satellite, aerial, and ground imagery in the IARPA WRIVA project
  - Played a pivotal role in the IARPA BETTER program and led the task of enhancing IE system by integrating sophisticated techniques for granular information extraction, question-answering, and textual entailment slot-filling, significantly improving BBN's system performance.
  - Engineered a Transformers-based Information Retrieval (IR) re-ranker system for the IARPA BETTER program, which markedly improved the efficacy of BBN's probabilistic IR system, leading to more accurate document retrieval.
  - Led a specialized effort under the DARPA HUGO program, overseeing the collection, curation, and assessment of Hindi datasets. Effectively communicated the accomplishments and progress to DARPA, ensuring transparency and alignment with project goals.
  - Maintaining an active role in contributing to BBN NLP repositories, helping in the refinement and evolution of the software stack.

Machine Learning Researcher, Shafiee Lab, Harvard Medical School   Dec 2017 – Aug 2021
Brigham and Women's Hospital   Cambridge, MA
- ○ *Supervisor: Dr. Hadi Shafiee*
- ○ Led machine learning projects addressing critical unmet needs in human fertility and viral diagnostics. Collaborated with a diverse team of clinicians and engineers, resulting in the publication of 22 journal and conference articles.

  - Designed two state-of-the-art adversarial unsupervised and self-supervised domain adaption methods and investigated domain-shifted medical datasets. (Nature BME Journal).
  - Developed generalization method utilizing unsupervised adversarial learning for smartphone-based multi-viral diagnosis.
  - Created highly curated benchmark medical datasets of 500,000+ images for domain adaption with detection algorithms.
  - Devised an automated deep learning framework for In Vitro fertilization (IVF) that outperformed embryologists.
  - Applied computer vision and machine learning techniques to smartphone-based low-cost point-of-care ovulation prediction device and deployed into an Android application which predicts ovulation at-home with 99% accuracy.

- Developed web/mobile apps (Vue.js, Flask, Android) for medical image datasets acquisition and annotation, and for deploying ML algorithms to production, utilized by clinicians from 9+ hospitals and health clinics in the US.
- Built point-of-care interfaces for low-cost diagnostic ($< \$1$) devices with embedded Internet of Things (IoT) systems.
- Managed and mentored a team of research interns in applying computer vision and deep learning to medical imaging projects.

App Developer Aug 2016 – Nov 2017
300dpi Design. Inc Thanjavur, India

- Primarily involved designing and building Android applications. These apps were custom-made for university cultural festivals, aiming to enhance the experience for both participants and organizers. They successfully served a user base of over 10,000 students from various colleges across India, with Sastra University being our primary client for these projects.

Research Assistant, Electric Vehicle Eng. and Robotics (EVER) Lab Apr 2016 – Nov 2017
SASTRA University Thanjavur, India
  ○ *Advisor: Dr. NS Manigandan*

- Worked on engineering projects in mobile and aerial robotics. Decreased CoroBot (mobile robot) costs by 40% by integrating semantic segmentation deep learning algorithm with low-cost lidar and radar sensors for indoor Simultaneous Localization and Mapping(SLAM) instead of high-cost Lidar.
- Designed and implemented end-to-end autonomous control for drone GPS navigation system for agricultural crop spraying.

PROFESSIONAL SERVICE

Reviewer for Journal of Cell Reports Medicine, Impact Factor (16.988)

Reviewer for Computational and Structural Biotechnology Journal, Impact Factor (6.0)

Reviewer for Scientific Reports - Nature, Impact Factor (4.6)

Reviewer for iScience Journal - Cell Press, Impact Factor (5.08)

Reviewer for Journal of Assisted Reproduction and Genetics (JARG), Impact Factor (3.5)

Reviewer for Qeios, open peer-review journal

PUBLICATIONS

- Jiang, V., Kartik, D., Thirumalaraju, P., **Kandula, H.**, Kanakasabapathy, M., Souter, I., Dimitriadis, I., Bormann, C., and Shafiee, H. (2023). Advancements in the future of automating micromanipulation techniques in the IVF laboratory using deep convolutional neural networks. Journal of Assisted Reproduction and Genetics, 40(2), 251–257.

- Jiang, V., **Kandula, H.**, Thirumalaraju, P., Kanakasabapathy, M., Cherouveim, P., Souter, I., Dimitriadis, I., Bormann, C., and Shafiee, H. (2023). The use of voting ensembles to improve the accuracy of deep neural networks as a non-invasive method to predict embryo ploidy status. Journal of Assisted Reproduction and Genetics, 40(2), 301–308.

- Suarez-Trujillo, A., **Kandula, H.**, Kumar, J., Devi, A., Shirley, L., Thirumalaraju, P., Kanakasabapathy, M., Shafiee, H., and Hart, L. (2022). Validation of a smartphone-based device to measure concentration, motility, and morphology in swine ejaculates. Translational Animal Science, 6(4), txac119.

- Hammer, K., Jiang, V., Kanakasabapathy, M., Thirumalaraju, P., Kandula, H., Dimitriadis, I., Souter, I., Bormann, C., and Shafiee, H. (2022). Using artificial intelligence to avoid human error in identifying embryos: A retrospective cohort study. Journal of Assisted Reproduction and Genetics, 39(10), 2343–2348.

- Kanakasabapathy, M., Thirumalaraju, P., **Kandula, H.**, Doshi, F., Sivakumar, A., Kartik, D., Gupta, R., Pooniwala, R., Branda, J., Tsibris, A., and others (2021). Adaptive adversarial neural networks for the analysis of lossy and domain-shifted datasets of medical images. Nature Biomedical Engineering, 1–15.

- **Kandula, H.**, and Min, B. (2021). Improving Cross-Lingual Sentiment Analysis via Conditional Language Adversarial Nets. In Proceedings of the Third Workshop on Computational Typology and Multilingual NLP (pp. 32–37).

- Silva, F., Erdogmus, E., Shokr, A., **Kandula, H.**, Thirumalaraju, P., Kanakasabapathy, M., Hardie, J., Pacheco, L., Li, J., Kuritzkes, D., and others (2021). SARS-CoV-2 RNA Detection by a Cellphone-Based Amplification-Free System with CRISPR/CAS-Dependent Enzymatic (CAS-CADE) Assay. Advanced materials technologies, 2100602.

- Shokr, A., Pacheco, L., Thirumalaraju, P., Kanakasabapathy, M., Gandhi, J., Kartik, D., Silva, F., Erdogmus, E., **Kandula, H.**, Luo, S., and others (2020). Mobile health (mHealth) viral diagnostics enabled with adaptive adversarial learning. ACS nano, 15(1), 665–673.

- Potluri, V., Kathiresan, P., **Kandula, H.**, Thirumalaraju, P., Kanakasabapathy, M., Pavan, S., Yarravarapu, D., Soundararajan, A., Baskar, K., Gupta, R., and others (2019). An inexpensive smartphone-based device for point-of-care ovulation testing. Lab on a Chip, 19(1), 59–67.

- Bormann, C., Kanakasabapathy, M., Thirumalaraju, P., Gupta, R., Pooniwala, R., **Kandula, H.**, Hariton, E., Souter, I., Dimitriadis, I., Ramirez, L., and others (2020). Performance of a deep learning based neural network in the selection of human blastocysts for implantation. Elife, 9, e55301.

- Kanakasabapathy, M., Thirumalaraju, P., Bormann, C., **Kandula, H.**, Dimitriadis, I., Souter, I., Yogesh, V., Pavan, S., Yarravarapu, D., Gupta, R., and others (2019). Development and evaluation of inexpensive automated deep learning-based imaging systems for embryology. Lab on a Chip, 19(24), 4139–4145.

- Thirumalaraju, P., Kanakasabapathy, M., Bormann, C., **Kandula, H.**, Pavan, S., Yarravarapu, D., and Shafiee, H. (2019). Human sperm morphology analysis using smartphone microscopy and deep learning. Fertility and Sterility, 112(3), e41.

- Kanakasabapathy, M., Thirumalaraju, P., Bormann, C., **Kandula, H.**, Pavan, S., Yarravarapu, D., and Shafiee, H. (2019). Deep learning-enabled smartphone-based system for automated embryo assessments and evaluation. Fertility and Sterility, 112(3), e285–e286.

- Dimitriadis, I., L. Bormann, C., Kanakasabapathy, M., Thirumalaraju, P., **Kandula, H.**, Yogesh, V., Gudipati, N., Natarajan, V., C. Petrozza, J., and Shafiee, H. (2019). Automated smartphone-based system for measuring sperm viability, DNA fragmentation, and hyaluronic binding assay score. Plos one, 14(3), e0212562.

- Kanakasabapathy, M., Thirumalaraju, P., Gupta, R., Pooniwala, R., **Kandula, H.**, Souter, I., Dimitriadis, I., Bormann, C., and Shafiee, H. (2019). Improved monitoring of human embryo culture conditions using a deep learning-derived key performance indicator (KPI). Fertility and Sterility, 112(3), e70–e71.

- Thirumalaraju, P., Bormann, C., Kanakasabapathy, M., **Kandula, H.**, and Shafiee, H. (2019). Deep learning-enabled prediction of fertilization based on oocyte morphological quality. Fertility and Sterility, 112(3), e275.

- Thirumalaraju, P., Kanakasabapathy, M., Gupta, R., Pooniwala, R., **Kandula, H.**, Souter, I., Dimitriadis, I., Bormann, C., and Shafiee, H. (2019). Automated quality assessment of individual embryologists performing ICSI using deep learning-enabled fertilization and embryo grading technology. Fertility and Sterility, 112(3), e71.

- Kanakasabapathy, M., Thirumalaraju, P., Bormann, C., Gupta, R., Pooniwala, R., **Kandula, H.**, Souter, I., Dimitriadis, I., and Shafiee, H. (2020). Deep learning mediated single time-point image-based prediction of embryo developmental outcome at the cleavage stage. arXiv preprint arXiv:2006.08346.

- Bormann, C., Thirumalaraju, P., Kanakasabapathy, M., **Kandula, H.**, Souter, I., Dimitriadis, I., Gupta, R., Pooniwala, R., and Shafiee, H. (2020). Consistency and objectivity of automated embryo assessments using deep neural networks. Fertility and sterility, 113(4), 781–787.

- Thirumalaraju, P., Kanakasabapathy, M., Bormann, C., Gupta, R., Pooniwala, R., **Kandula, H.**, Souter, I., Dimitriadis, I., and Shafiee, H. (2021). Evaluation of deep convolutional neural networks in classifying human embryo images based on their morphological quality. Heliyon, 7(2), e06298.

- Meyer, A., Dickinson, J., Kelly, N., **Kandula, H.**, Kanakasabapathy, M., Thirumalaraju, P., Bormann, C., and Shafiee, H. (2020). Can deep convolutional neural network (CNN) be used as a non-invasive method to replace Preimplantation Genetic Testing for Aneuploidy (PGT-A)?. In Human Reproduction (pp. I238–I238).

- Bormann, C., Curchoe, C., Thirumalaraju, P., Kanakasabapathy, M., Gupta, R., Pooniwala, R., **Kandula, H.**, Souter, I., Dimitriadis, I., and Shafiee, H. (2021). Deep learning early warning system for embryo culture conditions and embryologist performance in the ART laboratory. Journal of assisted reproduction and genetics, 1–6.

- Bormann, C., Curchoe, C., Thirumalaraju, P., Kanakasabapathy, M., Gupta, R., Pooniwala, R., **Kandula, H.**, Souter, I., Dimitriadis, I., and Shafiee, H. (2021). Deep learning early warning systemfor embryo culture conditions and embryologist performance in the ART laboratory (Apr, 10.1007/s10815-021-02198-x, 2021). Journal of Assisted Reprodction and Genetics.

- Jiang, V., Kanakasabapathy, M., Thirumalaraju, P., **Kandula, H.**, Souter, I., Dimitriadis, I., Bormann, C., and Shafiee, H. (2021). The use of voting ensembles and patient characteristics to improve the accuracy of deep neural networks as a non-invasive method to classify embryo ploidy status. In ASRM 2021 Scientific Congress and Expo.

- Fitz, V., Kanakasabapathy, M., Thirumalaraju, P., **Kandula, H.**, Ramirez, L., Boehnlein, L., Swain, J., Curchoe, C., James, K., Dimitriadis, I., and others (2021). Should there be an "AI" in TEAM? Embryologists selection of high implantation potential embryos improves with the aid of an artificial intelligence algorithm. Journal of Assisted Reproduction and Genetics, 1–8.

TECHNICAL SKILLS	
	Programming/Scripting: Python, Java, Perl, MATLAB, C, C++, Linux Shell Scripting
	Tools/Frameworks: PyTorch, TensorFlow, Keras, OpenCV, Huggingface, Spacy, Scikit-learn, Pandas, Spark, CUDA, ROS, Git
	App Development: Android, Flutter, React.js, Vue.js, Node.js, SQL, Flask,
	DevOps: Docker, Amazon Web Services (AWS), Google Cloud(GCP), Kubeflow

ACHIEVEMENTS & SCHOLARSHIPS		
	Full Tuition Scholarship, Tufts University	2019
	Grand Prize Award, MakeMIT 2018, Massachusetts Institute of Technology	Jan 2018
	1st place out of 30 competing teams at Sharkhack 2019, Simmons University.	Mar 2019
	Winner of Gauntlet among 300 participants, DAKSH'17, SASTRA University	Feb 2017
	1st place of Eleckart among 95 teams, SHAASTRA'17, IIT-Madras	Jan 2017