Revant Teotia

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Education

Columbia University — New York, NY
M.S. in Computer Science, GPA: 4.08/4.0 — *Expected Dec 2022*

Indian Institute Of Technology Kanpur — Kanpur, India
B.Tech. in Computer Science and Engineering, GPA: 8.4/10.0 — *May 2017*

Publications

- Few-shot Visual Relationship Co-localization,
  Revant Teotia, Vaibhav Mishra, Mayank Maheshwari, Anand Mishra,
  ICCV 2021 [paper][project page][code]

- Realtime Indoor Workout Analysis Using Machine Learning & Computer Vision,
  Amit Nagarkoti, **Revant Teotia**, Amith K. Mahale, and Pankaj K. Das,
  IEEE EMBC 2019 [paper]

Work Experience

- **Computer Science Department, Columbia University** — New York, NY
  Graduate Research Assistant in Carl Vondrick's group — *Sep 2021 - Present*
  - **Explainable object classification**
    - Working on making deep learning based object classification models more explainable using object attributes

- **Indian Institute of Technology Jodhpur** — Jodhpur, India
  Research Assistant in Vision, Language, and Learning Group (VL2G) led by Dr. Anand Mishra — *Jul 2020 - Aug 2021*
  - **Few-shot Visual Relationship Co-Localization** [paper][project page][code]
    - Analyzed novel problem of Visual Relationship Co-localization and invented a meta-learning based optimization framework to solve it in a few-shot manner
    - Accepted in highly competitive **ICCV 2021**
  - **Using Scene Text and Encyclopedic Knowledge for enhanced Image Retrieval**
    - Developed a novel multimodal-transformer architecture in PyTorch for knowledge-aware image retrieval
    - Created a custom dataset of 15K images and manually annotated 45K queries for training and evaluation
    - Currently under review

- **Samsung R&D Institute** — Bangalore, India
  Senior Software Engineer, Samsung Health Team — *Jul 2017 - Jul 2019*
  - **Fitness Machine Connectivity for Wearable Smartwatch using NFC/BLE** [news]
    - Worked in Health Service Team at Samsung HQ, **Suwon, South Korea**
    - Designed and developed the modules for **BLE-GATT communication** between Smartwatch and Fitness machines
    - Developed the modules for **NFC handshake** process for seamless and secure connection between Smartwatch and Fitness machines
    - Communication service was announced at **CES2020** and is enjoyed by millions of Samsung smartwatch users
  - **Virtual Coach Research Project** [paper]
    - Developed a system to evaluate user's performance while performing a workout following a reference video. The system detects deviations from the ideal body pose and suggests corrections
    - The system uses **CNN based human pose estimation, optical flow and DTW (Dynamic Time Warping) algorithm** as the core building blocks
    - Research published in **IEEE EMBC 2019**

- **Samsung R&D Institute** Bangalore, India
  Summer Intern, S-Voice/Bixby Natural Language Understanding (NLU) Team *May 2016 - Jul 2016*
  - **Voice Engine for Third Party Developers**
    * Worked in a team for designing a software which **enables third party developers to add voice functionality** to their projects
    * Devised and implemented the **context management** architecture for the third party voice engine

Selected Academic Projects

- **Image Retrieval using Sketch+Text description** [project report][slides][code]
  Deep Learning for Computer Vision Course, Columbia University Fall21 *Oct 2021 - Dec 2021*
  - Defined a novel retrieval problem which takes sketch and text description as a query and retrieves its corresponding image from an image database.
  - Created a custom dataset of 90k query-target pairs using attribute annotations from Visual Genome dataset for the novel problem and developed a contrastive learning based image retrieval model in PyTorch to solve it.

- **Natural Language Processing Tasks with Attention Models in Trax** [certificate]
  Natural Language Processing Specialization Course, deeplearning.ai *Jun 2020 - Oct 2020*
  - Built an **English-to-German neural machine translation (NMT)** model using Long Short-Term Memory (LSTM) networks with attention and Minimum Bayes Risk (MBR) decoding
  - Implemented the **Transformer Decoder from scratch** for text summarization and trained it on CNN/DailyMail summarization dataset
  - Implemented the Bidirectional Encoder Representations from Transformers **(BERT) from scratch** to be pre-trained on C4 Dataset
  - Fine-tuned a pre-trained **T5 Model** (Text-To-Text Transfer Transformer) on Stanford Question Answering Dataset **(SQuAD)** for reading comprehension **question-answering**

- **Chest X-Ray Medical Diagnosis and Brain Tumor Auto-Segmentation for MRI** [certificate]
  AI for Medicine Specialization Course, deeplearning.ai *Apr 2020 - May 2020*
  - Trained the top-layers of pre-trained *DenseNet121* model to diagnose pathologies (Pneumonia, Edema, Cardiomegaly) in Chest X-rays of *ChestX-ray8* dataset
  - Analysed and trained *3D U-Net model* for Volumetric Segmentation of MRI Images (DICOM format) with *Multi-Class Soft Dice Loss* as the loss function using the data from the *Decathlon 10 Challenge*

- **Explorations in handwritten digit classification using the MNIST data** [presentation]
  Dr. Piyush Rai, Dept. of CSE, IIT Kanpur *Jul 2016 - Nov 2016*
  - Implemented and analysed different machine learning tools and algorithms to fine-tune and classify the MNIST data and achieve the best classification accuracy possible
  - Implemented PCA (principal component analysis) to project the data on the 50 most important directions to reduce the redundant data and decrease the data dimentionality
  - The methods that we considered included SVM, K-NN, Random Forests, Logistic Regression and LeNet (CNN method)

- **Classification of Emotions in music** [poster]
  Dr. Amitabha Mukerjee, Dept. of CSE, IIT Kanpur *Jan 2016 - Apr 2016*
  - Implemented and compared different classifiers to classify music (dataset included 903 clips of 30 second each) into 6 Clusters of emotions to get optimal classification results
  - Extracted different audio features like rms of loudness, MFCC, zero crossing rate, variance, and other spectral features to train classifiers
  - Manually fine tuned the parameters of different classifiers(k-NN, SVM, Naive Bayes etc.) using grid search and dimensionality reduction.

Scholastic Achievements

- Secured **All India Rank-303** (top 0.2% among **150,000** candidates) in **JEE ADVANCED 2013**
- **JEE MAINS 2013** : Secured **All India Rank-94** (among **1.4 million**) and secured **State Rank-4** in Rajasthan
- **National Standard Examination in Physics 2012** : Got placed in **Statewise top 1%** in Rajasthan
- Cleared **National Standard Examination in Chemistry-2012** (Stage-1) and appeared in **INCHO 2013**

Technical Skills

- **Programming Languages/Scripts**: : Python, C/C++
- **Libraries**: Pytorch, PyTorch Geometric, TensorFlow, Keras, Trax, OpenCV
- **Software and Tools**: Git version control, Tizen-Studio, Latex, Jupyter/IPython Notebook
- **Wireless Communication Protocols**: Bluetooth LE Generic Attribute Profile (BLE-GATT), NFC(basics)

Relevant Courses

- **AI**: Introduction to Machine Learning, Artificial Intelligence Programming, NLP Specialization*, GANs Specialization* AI for Medicine Specialization*, TensorFlow: Data and Deployment Specialization*, TensorFlow in Practice Specialization*, Deep Learning for Computer Vision, Natural Language Processing
- **Computer Science**: Data Structures and Algorithms, Introduction to Software Engineering, Computer Organisation, Theory of Computation, Operating Systems, Analysis of Algorithms, Compiler Design, Principles of Database Systems
- **Mathematics**: Linear Algebra, Probability and Statistics, Differential Equations, Single and Multi-Variate Calculus, Abstract Algebra, Logic in Computer Science, Discrete Mathematics

*-online Coursera courses

Extra Curricular and Voluntary Work

- **Student Guide**, Counseling Service IIT Kanpur (2014-2015 session)
  - Assisted in organizing the Orientation Program for the incoming batch of 830 students
  - Assisted several first year students personally in overcoming their initial anxieties and guided them so that they can settle down comfortably in the campus