# VISHAL KESWANI

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## EDUCATION

| Indian Institute of Technology, Kanpur | BS-MS Economics Minor-Machine Learning | 10/10 (PG) 8.6/10 (UG) | **Department Rank 1** in MS batch Graduation with **Distinction** | 2021 |
|---|---|---|---|---|
| Kendriya Vidyalaya 1, Ajmer | CBSE (Senior Secondary) | 96.4/100 | School Rank 1 and **Best Student** | 2015 |
| East Point School, Ajmer | RBSE (Secondary) | 94.2/100 | School Rank 1, 100% in Mathematics | 2013 |

## SCHOLASTIC ACHIEVEMENTS

### Scholarships and Grants

- One of 2 Economics students in India to receive prestigious research grant of SURGE, IITK (2018)
- Selected for MCM scholarship by SSPC, IIT Kanpur for one academic year (2016-17)
- Received DONOR scholarship by SSPC, IIT Kanpur for the spring semester (2016-17)

### Awards

- **Ranked 1$^{st}$** in FinSim international challenge under FinNLP Workshop on NLP in the FinTech Domain (2020)
- **Stood 1$^{st}$** in Task A of Memotion Analysis under SemEval International Challenge (on Semantic Evaluation) (2020)
- Earned DeepLearning.AI **TensorFlow Developer Professional Certificate** (Specialization of 4 courses) (2020)
- Received **Commendation Certificate** for excellent performance under SURGE'18 program of IIT Kanpur (2018)
- Bagged the **Best Staff's Pick Project Award** in the course TA201A (Technical Arts) in a batch of 380 (2018)
- Ranked in **top 0.05%** in JEE Mains (City Rank 1) and **top 0.15%** in JEE Advanced (City Rank 2) (2016)
- Awarded **Certificate of Merit** by **MHRD** and **KVS** for exceptional performance in C.B.S.E. examination (2015)
- Awarded **Certificate of Appreciation** by **MCA** for outstanding performance in R.B.S.E. examination (2013)

## PUBLICATIONS

### Hypernym Detection in the Financial Domain via Context-Free and Contextualized Word Embeddings

FinNLP-2020, 2$^{nd}$ *International Workshop on Financial Technology and NLP, IJCAI-PRICAI 2020*
- Reviewed Bordea et al. (2015), Camacho-Collados and Navigli (2017), Shwartz et al. (2016), Fu et al. (2017) etc
- Used **Word2vec** word-embeddings trained on corpus from scratch and **pre-trained BERT** word-embeddings
- Classified embeddings using distance metrics (L2, L1), cosine-similarity and simple classifiers (Logistic, Naïve Bayes)
- Word2vec with **Naïve Bayes** & BERT with **Logistic Regression** gave best test accuracy of **88%** & mean rank 1.2

### Unimodal and Bimodal Sentiment Analysis of Internet Memes

SemEval-2020, 14$^{th}$ *International Workshop on Semantic Evaluation, COLING-2020*
- Explored **Multimodal Machine Learning** for combining CV and NLP (Morency and Baltrusaitis,2017)
- Reviewed Vaswani et al. (2017), Devlin et al. (2019), Oquab (2014), Keila et al. (2019), Qian et al. (2016) etc
- Implemeted **CNN** (image-only) and **FFNN** (text-only), combined using SVM, RF and Neural Network
- Implemented Naïve Bayes (text-only), fine-tuned **BERT** (text-only) & **Multimodal Bitransformer** (text+image)
- Text-only FFNN with Word2vec embeddings performed best, outperforming baseline **Macro-F1** by **63%**

## INTERNSHIP PROJECTS

### MURATA VIOS | Computer Vision Intern (May'20-Aug'20)

**Computer Vision on Edge devices for the visually impaired using TensorFlow Lite**
- Streamlined the pipeline: converting raw images to tfrecords, training, conversion of checkpoints to **tflite** format
- Customized **Object detection** (COCO dataset) and **Face Detection** (Open Images dataset) for Raspberry Pi 4
- Trained quantized **MobileNet V2** on LFW dataset & user faces, obtained **Face Recognition** accuracy upto **93%**
- Linked face detection and recognition systems, used frame-averaging and thresholding for robust predictions

### NOKIA SOLUTIONS AND NETWORKS | NLP Intern (May'19-July'19)

**Auto-Suggesting inquiry questions to Care Engineer based on client case**
- Extracted e-mail bodies (doc to csv), followed by tokenization, removal of stop words, stemming, lower casing in **nltk**
- Vectorized rows using term frequency-inverse dpocument frequency (tf-idf scores), used to calculate cosine-similarity
- Clustered client queries using **k-means**, for a new query, reported questions corresponding to 3 most similar clusters

### SURGE, CSE Department | Research Intern | *Mentor: Dr Nisheeth Srivastava* (May'18-Dec'18)

**Effect of probabilistic sample size on preference behavior via web game**
- Designed web experiment using HTML, CSS, JavaScript; simulated bets via **Box-Muller** method & Logistic function
- Made 4 types of trails, computed mean reaction times & performed outlier detection using **IQR** method in MATLAB

## KEY PROJECTS

### MNIST Classification and Generative Modelling (Jan'20-Apr'20)

*Mentor: Dr Vipul Arora, Department of Electrical Engineering, IIT Kanpur*
- Reviwed Rezende et al. (2014, 2015), Kobyzev ey al. (2019), Kingma et al. (2015, 2018), Berg et al. (2019)
- Implemented **VAE** with Planar Normalizing Flows to generate MNIST digits, least loss for flow length 8 with K=6
- Implemented **PCA** & **NMF** from scratch, classified MNIST images, NMF gave 80% accuracy on the testset for K=3

### Product Recommendation System (Aug'19-Nov'19)

*Mentor: Dr Purushottam Kar, Department of Computer Science and Engineering, IIT Kanpur*
- Explored different algorithms from the extreme multi-label classification repository (manikvarma.org)
- Reviewed top 3: Prabhu et al., 2018 (Parabel), Jain et al., 2016 (PfastreXML), Prabhu & Varma, 2014 (FastXML)
- Trained the 3 algorithms on a dataset of 10k users, represented by ~16k features, with ~3k labels of interest
- **FastXML** performed overall best with model size **1.42mb**, prec@1 **80.4%**, and prec@3 **49.7%** on the test dataset

### Twitter sentiment analysis of 'Tradewar' tweets (Aug'19-Nov'19)

*Mentor: Dr Somesh Mathur, Department of Economic Sciences, IIT Kanpur*
- Reviewed Medhat, Hassan, & Korashy (2014), O'Connor et al. (2010), Bermingham & Smeaton (2011) etc
- Extracted twitter data (10m tweets) filtered by keyword 'tradewar' from Jan 2018 (beginning of US-China tradewar)
- Trained Naive Bayes, Maximum Entropy & Decision Tree; NB gave the best accuracy ( 74%) & training time
- Aggregated polarity scores (probabilities) to get daily trend, hence, constructed a subjective proxy for policy decisions

### ARIMA vs LSTM: Time Series Forecasting (Jan'19-Apr'19)

*Dr Deep Mukherji, Department of Economic Sciences, IIT Kanpur*
- Reviewed econometrics vs deep learning models: Ahmed et al. (2010), Siami-Namini et al.(2018), Brownlee (2016-17)
- Obtained seasonally adjusted real US GDP (quarterly), used **9:1 split** with walk-forward validation (rolling forecasts)
- Used 9:1 train-test split due to high prediction time and used walk-forward validation (rolling forecasts)
- Used MSE for tuning and model evaluation, **ARIMA(1,1,1)** performed best among the econometric models
- **LSTM** showed **23%** reduction in test MSE with 2 neurons and **18%** with just 1 just neuron (batch-size-1, epochs-10)

## RESEARCH ACTIVITIES

- Presented paper in the 2nd International Workshop on Financial Technology and NLP, IJCAI-PRICAI (2020)
- Attended the Articial Intelligence for Narratives Workshop, IJCAI-PRICAI (2020)
- Reviewer in the 14th International Workshop on Semantic Evaluation, COLING (2020)
- Presented poster in Students-Undergraduate Research and Graduate Excellence Program, IIT Kanpur (2018)

## RELEVANT SKILLS & COURSES

**Programming:** Python, R, C, C++, HTML, CSS, JavaScript | **Others:** SQL, Bash, Linux, Windows, MS Office, Latex
**Familiar Python Packages:** TensorFlow, Pytorch, Pm4Py, NumPy, Pandas, Nltk, Keras, TextBlob, ScikitLearn

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|---|---|---|---|
| Natural Language Processing | Probability and Statistics | Bayesian Econometrics | Fundamentals of Computing |
| ML for Signal Processing | Linear Algebra | Financial Econometrics | Data Structures & Algorithms |
| Intro to Machine Learning | Real Analysis & Calculus | Stochastic Processes | Principles of Database Systems |
| Econometrics I and II | Psychology of Language | Social Cognition | Philosophy of Cognitive Science |

## EXTRA-CURRICULAR ACTIVITIES

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| **Positions of Responsibility** | • **Company Coordinator, Student Placement Office** <br> Ensured smooth conduction of PPTs, GDs, invigilated during tests, interacted with company officials <br> • **Senior Executive, Media & Publicity, Entrepreneurship Cell** <br> Aided in organization of eSummit and TEDx, created articles & posts for online media for promotion <br> • **Secretary, Fine Arts Club and Ritambhara** <br> Co-organied ArtFest, Freshers' Night, Workshops and various fashion events during Antaragni 2017 |
| **Leadership** | • Became **School Captain**, represented school in events and assembly and implemented rules <br> • **Captained School Cricket Team** and won Fair-Play award in an open cricket tournament |
| **Communication** | • Secured **1st position** in British Parliamentary Debate in Galaxy (Inter-pool cultural fest of IITK) <br> • **Anchored** in the department Freshers' Night, also performed speed art in batch Freshers' night <br> • **Best Speaker** from region in Youth Parliament Competition, Zonal level (5 zones in India) <br> • Stood in **top 150** in Tata Building India Essay Competition among 2 million participants twice |