Kartik Narayan

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Linkedin — Github — Personal Website — Google Scholar

EDUCATION

Indian Institute of Technology Jodhpur — Jodhpur, India
Bachelors in Computer Science & Engineering; GPA: 8.92; Department Rank: 2 — *Aug 2019 - Present*

Courses: Pattern Recognition & Machine Learning, Advanced Machine Learning, Deep Learning, Computer Vision, Probability,Statistics & Stochastic Processes, Linear Algebra & Differential Equations, Human-Machine Interaction.

PUBLICATIONS

- **DF-Platter: Multi-subject Heterogeneous Deepfake Dataset(paper / poster)**
  Narayan, K.*, Agarwal, H.*, Thakral, K.*, Mittal, S.*, Vatsa, M. and Singh, R.
  CVPR 2023.

- **DeSI: Deepfake Source Identifier for Social Media (paper / ppt / poster / demo)**
  Narayan, K.*, Agarwal, H.*, Mittal, S., Thakral, K., Kundu, S., Vatsa, M. and Singh, R.
  2022. IEEE/CVF Conference on Computer Vision and Pattern Recognition Workshops (pp. 2858-2867).

- **DeePhy: On Deepfake Phylogeny (paper — ppt / poster / live demo / demo)**
  Narayan, K., Agarwal, H., Thakral, K., Mittal, S., Vatsa, M. and Singh, R.
  2022. International Joint Conference on Biometrics.

- **Using Epidemic Modeling, Machine Learning and Control Feedback Strategy for Policy Management of COVID-19 (paper / code)**
  Narayan, K., Rathore, H. and Znidi, F. 2022. IEEE Access, 10, pp.98244-98258.

- **Leveraging ambient sensing for the estimation of curiosity-driven human crowd (paper)**
  Das, A., **Narayan, K.** and Chakraborty, S.
  2022, April. In 2022 IEEE International Systems Conference (SysCon) (pp. 1-8). IEEE.

RESEARCH EXPERIENCE

- **Phylogeny in Deepfakes**
  Research Project - Prof. Mayank Vatsa & Prof. Richa Singh — *[Mar 2022 - Aug 2022]*
  - Extended the idea of phylogeny existing in the domain of Image Processing & Multimedia to deepfakes. Developed a novel DeePhy dataset to assist research in the direction of plagiarism detection and forgery detection.
  - Dataset provided deepfakes generated using three generative techniques and contains a total of 18 phylogeny sequences to assist research in reverse engineering of deepfakes.
  - Concluded that the existing deepfake detection methods are not ready to handle phylogenetic deepfakes and in future the algorithms should be capable of model attribution and sequence prediction along with deepfake detection.

- **CSE Department IIT Jodhpur**
  Research Intern - Prof. Mayank Vatsa & Prof. Richa Singh — *[May 2022 - July 2022]*
  - **Multi-face Low Resolution and Occluded Deepfakes**: Developed inherently low-resolution and occluded deepfakes in frames having multiple subjects. Collected real-videos from publicly available repository Youtube and modified FSGAN, FaceShifter and FaceSwap generation techniques to achieve the goal.
  - **AWS Deployment**: Deployed a web app with deep learning models on AWS using custom ec2 instance with GPU.

- **DeSI: Deepfake Source Identifier for Social Media** — Website
  Research Project - Prof. Mayank Vatsa & Prof. Richa Singh — Funded by Ministry of Home Affairs — *[May 2021 - Mar 2022]*
  - Developed an algorithm to flag tweets with deepfake media and find the source/propagator of such viral deepfake content on Twitter using temporal data filtering. The DeSI framework filters media relevant to a given text query and also has an option to filter tweets similar to a given input image/video. Used a Xception baseline model for deepfake detection, LightCNN model for feature extraction and cosine similarity for image/video matching.
  - The result is shown in form of a force-directed graph which gives temporal insight into the spread pattern and also identifies the volatile nodes in the network by predicting the virality of tweets. The project is deployed for easy use.

- **Estimation of Curosity-Driven Human Crowd**
  Research Project - Dr. Suchetana Chakraborty — *[Sept 2021 - Nov 2021]*
  - Implemented regression algorithms on sensor data for prediction of curiosity-driven human crowd by leveraging spatio-temporal parameters. Performed extensive data cleaning on real-world data of CSI and sensor values.
  - Applications in wide range of smart-city applications covering infrastructure automation to targeted advertising.

- **University of Texas, San Antonio**
  Research Intern - Dr. Heena Rathore *[Feb 2021 - Nov 2021]*
    - Designed a Machine Learning model with a weighted loss function optimised using L-BFGS-B algorithm to predict the optimal values of constants in SIR differential equations. It helps in forecasting the number of COVID-19 cases.
    - Predicted the optimal lockdown duration and developed an on-off policy control signal with lockdown duration as width and a LTI transfer function to optimize the duty cycle and width of the signal. The control signal values corresponds to various states of a heuristic model which suggests policies that the government should undertake.

SKILLS SUMMARY

- **Programming**: Python, C, C++, JavaScript, MATLAB, LaTeX
- **ML/DL**: Sklearn, Numpy, Pandas, Matplotlib, Seaborn, PyTorch, Tenserflow, Keras, OpenCV
- **Development**: HTML, CSS, React.js, Node.js, Bootstrap, Firebase, MongoDB, ReactNative
- **Tools**: Docker, Kubernetes, GIT, Matlab, AWS, Google Colab, Jupyter Notebook, Adobe Illustrator, Adobe Photoshop

ACADEMIC PROJECTS

- **Face De-Identification (Funded by MetaAI)**: *[Sept '22 - Present]*
  Developing an adaptable face privacy preservation generative algorithm where the user can control the extent of visual privacy while maintaining visual similarities and face modality. The algorithm developed is robust to zero-day attacks.
- **Injecting Diffusion in GANs**: *[Sept '22 - Nov '22]*
  Modified the stylegan2 backbone architecture by incorporating an adpative diffusion process and modifying the discriminator. At each diffusion timestep, there is a different noise-to-data ratio and the timestep-dependent discriminator learns to distinguish the diffused real data from the diffused generated data.
- **I2S (ID to Selfie) Face Verification (report)**: *[Jan '22 - Apr '22]*
  Proposed an algorithm for face-verification of selfie images to thier ID card images. The main challenge is that the ID card photos are of bad quality and in low resolution. Moreover, the age of the subject in the ID card doesn't match with the selfie image. We trained a model with ResNet-18 architecture backbone in siamese fashion using contrastive loss on the superresolved ID-card images to achieve the goal.
- **Modified Ubuntu (report)**: *[Jan '22 - Apr '22]*
  Improved the Ubuntu 21.04 release by implementing functionalities like parallel zipping, voice based commands and a parallel web searcher. Parallel Zipping uses RLE encoding to make the zipping of files non-concurrent and faster. An intelligent agent that offers both speech recognition and text-to-speech capabilities allows you to run a computer by voice commands. A web-searcher which employs multiple threads to make the web-scraping process faster.
- **WWWrite Collaborative Text Editor (report)**: *[Feb '22]*
  Implementation of a collaborative Text editor where multiple users will be able to read and edit the document simultaneously and support the complete development cycle of a product i.e. Ideation, Review and Feedback. Multiple users can edit a document simultaneously and each can have different level of access to the document.
- **Voice controlled Assistant (code)**: *[Jan '21]*
  Designed a voice based assistant using SpeechRecognition and pyttsx3 which offers voice-activated command controls. Implemented functionalities like advanced voice search, voice based youtube search, sending whatsapp voice message, sending voice mails, playing music, accessing web-browser, searching wikepedia, cracking jokes and much more.

TEACHING, MENTORING AND VOLUNTEERING EXPERIENCE

- **Teaching Assistantships:**
  Served as an undergraduate teaching assistant for a batch of 200+ second-year students, conducting weekly lab sessions, special doubt sessions, preparing quizzes and grading answer sheets for the following courses:
    - Pattern Recognition and Machine Learning *[Jan '22 - May '22]*
    - Introduction to Machine Learning *[Aug '22 - Dec '22]*
- **Reviewer Experience:** Served as a reviewer for IEEE Access and NeurIPS Dataset Track 2022.
- **Volunteering Experience:**
    - Internship Head, CSE at the placement cell of IIT Jodhpur *[July '21 - May '22]*
      Involved in contacting companies and inviting them to visit the campus for internships & placements.

    - Head of technical events in Prometeo, Technical and Entrepreneurial festival of IIT Jodhpur *['21 - '22]*
      Managed a team of 50+ students to conduct technical competitions for a footfall of 1500+ students all over India.

    - Secretary of PHEME, The IITJ Newsletter Club *[May '20 - July '21]*
      Managed the student club comprising of 80+ members involved in making newsletters, reports, conducting surveys, etc.

    - Student Guide at Student Wellbeing Committee, IITJ *[May '20 - Present]*
      Mentoring 10 freshmen from diverse backgrounds to ensure their smooth transition into college. Guiding them to excel in academic & non-academic pursuits.