Shanu Kumar

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https://github.com/Sshanu

Education

- **Indian Institute of Technology, Kanpur** — Kanpur, India
  Bachelor of Technology ; **CGPA:** 9.1/10 — July 2015 – Present
  - Major in Electrical Engineering
  - Minor in Artificial Intelligence
- **Adarsh Vikash Vidaylaya** — Patna, India
  Intermediate, Central Board of Secondary Education; **Percentage:** 92.4% — 2015
- **Lohianagar Mount Carmel High School** — Patna, India
  Indian Certificate of Secondary Education ; **Percentage:** 88% — 2013

Projects

- **Machine Comprehension**
  Course Project under Prof. Purushottam Kar, IIT Kanpur — Aug 2017 – Present
  - Developing a model which understands the content of given passage and then answers the questions related to it.
  - The architecture consists of Embedding layer, **Bi-directional LSTM** layer to refine the embedding, **Attention flow** layer to obtain a query-aware context representation and Output layer provides an answer to the query.
  - Embedding layer composed of word-level embedding **(GloVe)**, character-level embedding generated using **Convolutional Neural Networks(CNN)**, and part-of-speech(POS) tags and name-entity recognition(NER) tags embedding trained using **Skip-Gram** model.
  - **Attention layer** fuses the information from the context and the query words by giving attention to both context-to-query and query-to-context.
- **Relation Classification**
  Project Supervisor Prof. Harish Karnick, IIT Kanpur — May – July 2017
  - Developed a model in TensorFlow to classify the relation between two given entities in a sentence.
  - Model consisted of **Bidirectional sequential LSTMs** and **Bidirectional tree structured LSTMs** to capture both word sequence and dependency tree information respectively.
  - **Dependency layer** mainly focuses on the shortest path between a pair of target words in the dependency tree.
  - Stanford's Part of Speech Tagger and Dependency Parser used in NLTK for tagging the words and parsing the dependency tree. Pretrained word vectors from "**Glove**" used as word embedding.
  - Optimized the model by **Adam** gradient descent with gradient clipping and L2-regularization.
  - Dropout on final hidden layers and pretraining of Sequential Layer improved performance of the model.
- **Inventory Management**
  Project Supervisor Prof. Nisheeth Srivastava, IIT Kanpur — May 2017 – Present
  - Developing an app for **medicine detection** and **inventory management** of medicine products.
  - Detection model developed using **convolutional neural network**, is finely tuned according to the inventory in the store and is updated as new products are added in an online fashion.
  - Used **Single Shot Multibox Detector** (SSD) with MobileNet for cropping the product from the image.
- **Object Tracking and Detection**
  Project Supervisor Prof. Vinay P. Namboodiri, IIT Kanpur — Dec 2016
  - Tried to increase the accuracy of high speed **KCF tracker** with kernelized correlation filters by using convolutional layers as feature maps from pretrained VGG16 network.
  - Used a pretrained **Single Shot Detector** model for object detection in Caffe.
  - Studied research papers based on Deep Regression Networks for tracking and detection.
- **Wheat Grain Assaying**
  Project Supervisor Gaurav Agrawal, Assistant Secretary, Department of Agriculture, India — Dec 2016
  - Aimed to facilitate the process of automatic quality assessment of grain from images of spread out sample.
  - Proposed a general approach for converting an image of grains with impurities into a binary image.
  - Implemented **Watershed Segmentation** for segmenting each particle from binary image and classified each particle into grain or impurity using **K Nearest Neighbour** on features extracted like size, color, eccentricity.

- **Handwriting Recognition**
  Summer Project under Programming Club, IIT Kanpur June 2016
  - Received the **Special Mention** during the Science & Technology Summer Camp, IIT Kanpur.
  - Trained **convolutional neural architecture** to recognize handwritten English characters from images.
  - Torch Framework used for implementing neural network architecture and analyzing its performance.

Achievements

- Secured **AIR - 2499 in JEE (Advanced) 2015** among 1.25 lakh Candidates.
- Recipient of Merit-cum-means scholarship by IIT Kanpur on account of good academic performance for two consecutive years 2016-2017.

Relevant Courses

- **Computer Science:** Introduction to Natural Language Processing*, Introduction to Machine Learning, Data Structure And Algorithm, Fundamentals of Computing
- **Mathematics:** Probability and Statistics, Linear Algebra and ODE, Partial Differential Equation, Complex Variables, Real Analysis
- **Electrical Engineering:** Neural Networks*, Digital Signal Processing*, Digital Electronics, Microelectronics-I, Control System Analysis, , Principles of Communication, Power Systems
- **Others:** Psychology of Language*

* Next Semester Courses

Minor Projects

- **Automated Library**
  - Developed a Web Application in **Microsofts Code.Fun.Do.** for cataloguing bibliographies and library members in Django.
  - Used Goodreads and Bing API to display information about books like book review and book cover.
  - Included features like automatic fine calculation, reminder mail and search among books and members.
- **Movie Classification**
  - Implemented movie review classification model which is based on Kim's text classification model using **Convolutional Neural Networks** in Tensorflow.
- **Text Generation**
  - Implemented a model in Tensorflow for text generation from wikipedia articles which consisted of a **LSTM** layer to capture information from sequence of characters and a **Softmax** layer for predictioning next character.
- **Travelex**
  - Developed an app for finding nearby hotels and restaurants locating nearby during **Google Devfest 2016**.
  - Zomato and Expedia API used for hotel and restaurants search and Firebase as a database.
- **Image Classification**
  - Implemented a **Convolutional Network** based image classifier, using pre-trained Overfeat model in Torch.

Skills

- **Languages:** C/C++, Python, LaTeX, HTML, CSS, Matlab, Lua
- **Operating Systems:** Proficient in Windows and Linux environments
- **Software/Libraries:**: Tensorflow, Caffe, Torch, OpenCV, GNU Octave, Git, Django, Android Studio, Autocad

Extra-Curricular Activities

- Participated in **CodeChefs** annual multi-round programming competition, **SnackDown '17**.
- Participated in fabricating a Robot capable of gripping, lifting and transporting objects, in Takneek.