CHENYU WANG

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EDUCATION BACKGROUND

Hangzhou Dianzi University (HDU), Zhejiang, China 09/2017 – 06/2021
B.E. in Information Engineering | GPA: 4.05/5.0 | Ranking: 1/23

Coursework (Math & Software): Linear Algebra | Probability and Statistics | Stochastic Processes | Discrete Mathematics | Further Mathematics | Information Theory and Coding | Java Programming | Data Structure and Algorithm Design | Machine Learning | MATLAB & Simulation | Data Communication and Computer Network

Coursework (Hardware): Signals and Systems | Digital Signal Processing | Signal and System Experiment | Digital Circuits and Logic Design | Communication Circuits | Embedded System | IoT Technology and Application

STANDARDIZED TESTS

TOEFL: L:28 / R:29 / W:28 / S:22 / Total: 107

SKILLS

Programming Languages: C/C++ | Java | Python | MATLAB | R | SAS | MySQL | VHDL
Libraries: Scientific Computing (NumPy, SciPy) | Data Manipulation (Pandas) | Machine Learning (Scikit-Learn, PyTorch, Keras, TensorFlow) | Visualization (Matplotlib, Seaborn) | Computer Vision (OpenCV)
Software: Jupyter Notebook | Pycharm | LaTex | Git | Origin | OrCAD PSpice | MS Office | Altium Designer | Altera Quartus

AWARDS AND HONORS

The 1st Prize | HDU Academic Excellence Scholarship 09/2020
Top 8% | American Statistical Association (ASA) DataFest Competition 08/2019 – 11/2019
The 3rd Prize | China Collegiate Mathematics Competition 11/2018

PUBLICATIONS

- **Wang, C.,** Miao, X., Xi, Y., Bi, M., & Hu, W. (2020, Octerber). A New LightGBM-Based Equalizer Enabled High-Capacity PAM-4 and NRZ Transmission in the 10-G Class System. In *Asia Communications and Photonics Conference (ACP) / International Conference on Information Photonics and Optical Communications (IPOC)* (pp. M4A-325). Optical Society of America.
- Xi, Y., **Wang, C.,** Miao, X., Bi, M., & Hu, W. (2020, Octerber). High-Efficient Equalizer Based on the Simplified Deep Neural Network for 56Gb/s/λ PAM-4 in C-band 10G DML-Based Short Reach System. In *Asia Communications and Photonics Conference (ACP) / International Conference on Information Photonics and Optical Communications (IPOC)* (pp. M4A-325). Optical Society of America.
- Bi, M., **Wang, C.** (Contributed equally as Bi, M.), Miao, X., Xi, Y., Teng, X., & Hu, W. A Robust LightGBM-Based Equalizer Embedded with Featrue Selection Enabled High-Speed Short-reach Link with 10-G Class Optics. In *Journal of Lightwave Technology*. Under Review.
- **Wang, C.,** Miao, X., Xi, Y., Bi, M., Li, L., & Hu, W. Interpretable and Visualized SHAP-based Equalizer with Feature Selection in IMDD System. In *Optical Fiber Communication Conference 2021*. Under Review.

PATENT

- Bi, M., **Wang, C.,** Yang, G., Zhou, X., Chi, H., Hu, M., & Li, L. Improved LightGBM Equalization System and Method for IMDD Short-distance Optical Communication System. Patent CN111313971A, filed Feb. 28, 2020, and issued Jun. 19, 2020.

RESEARCH EXPERIENCES

Research on the Influence of Combined Effect in Low-Order Features on the Performance of Deep Learning Model, Sponsored by the National Natural Science Foundation of China (Grant No. 61906055) 12/2019 – 12/2020
Research Assistant, HDU | Advisor: Dr. Xuyang Teng

- Applied the cooperative game theory related solution, Shapley value, in the feature evaluation process, and visualized the effects of feature selection algorithms, designed and put the deep learning model into effect.
  - Examined the classification effects of the datasets, NSL-KDD and UNSW-NB15
  - Utilized the feature combination set after dimension reduction to dramatically shortened the operation time, and achieved the same effect within one-tenth of the original period with the help of SVM classifers
  - Integrated with the DBN model to extract the target feature combination, and used only 70% of its data to accomplish the same effect of what the origanl model could achieve
  - Delved further into the rationale of each sample in subsets with different features, and reduced 50% of the original dataset scale to reach the classification accuracy within the same range.

A New LightGBM-Based Equalization Scheme for High-Speed Optical Transmission
Research Assistant, HDU | Advisor: Prof. Meihua Bi 10/2019 – 11/2020

- Designed, prototyped, and optimized a LightGBM-based equalizer for processing digital signal associated with the high-speed optical transmission with the low-bandwidth intensity modulation and direct detection (IM/DD) technology.
  - Applied the new equalizer to a system based on 25 Gb/s NRZ and 50 Gb/s PAM-4 in 10 GHz optical devices to manifest its feasibility
  - Used embedded methods of feature selection for dimensionality reduction and lowered the computational complexity
  - Compared the two methods of “gain” and “split” for feature weighting, and eventually chose “split” in consideration of

the inevitable interference that the multicollinearity could cause to the "gain" method
- Deployed t-distributed stochastic neighbor embedding (t-SNE) to reduce the dimensionality, achieved the 2D visualization of the decision boundary for the LightGBM-based equalizer and the effects of classification
- Defined the parameter range by means of bias-variance decomposition, used the margin theory to illustrate certain phenomena occurring in the iterative convergence processes, and enhanced the robustness of algorithms
- Compared the new model against two conventional equalizer designs, i.e., decision feedback equalizer (DFE) and feed-forward equalizer (FFE), showing greatly improved scalability, reduced training cost, and suppressed bit error rate.
- A first-author paper presented in the 2020 ACP/IPOC.

Development of a High-Efficiency Equalizer Based on Deep Neural Network (DNN)
Research Assistant, HDU | Advisor: Prof. Meihua Bi 10/2019 – 11/2020

- Developed and characterized a simple DNN-based nonlinear equalizer (DNNE) to mitigate the linearity and nonlinearity penalties associated with the low-bandwidth and directly modulated laser (DML) in a PAM-4 modulated short reach optical transmission system:
  - Performed hyperparameter tuning based on Adam optimizer; utilized the dropout technique to delete neurons with a certain probability so as to simplify the model, with a focus on facilitating the model training and preventing overfitting.
  - Built a 56Gb/s per wavelength PAM-4 signal-based optical transmission system over single mode fiber (SMF) to verify the newly developed scheme.
  - Rigorously showed the DNNE's high receiver sensitivity, low bit error rate, and excellent nonlinear capabilities.
  - A 2nd author paper presented in the 2020 ACP/IPOC.

EXTRACURRICULAR ACTIVITIES

Kaggle Challenge: Ion Switching 05/2020

- Built, trained, validated, and tested a Light Gradient Boosting Machine (LightGBM) model to predict ion switching based on electric signals for disease diagnosis purpose.
  - Performed data cleansing and leveraged various feature engineering techniques to support the model construction.
  - Benchmarked the model performance based on accuracy metrics and micro-averaged F1 score.

Kaggle Challenge: SIIM-ISIC Melanoma Classification Challenge 07/2020

- Built a deep learning model in PyTorch, JupyterLab and Google Cloud to identify melanoma in images of skin lesion:
  - Preprocessed skin lesion images with two data augmentation techniques, i.e., (1) CutMix augmentation which cuts and pastes random patches between the training images for increasing localization ability, and (2) Mixup augmentation which mixes two samples by linear interpolation of their images and labels.
  - Trained the image classifier based on Google's EfficientNet-b5, a lightweight convolutional neural network architecture for image classification.
  - Performed five-fold cross validation for hyperparameter tuning, leading to 85% overall accuracy.

***Team Leader* | Online Mathematical Contest in Modeling (MCM)** 03/2020

- Led a team of three to complete a data-driven study to establish business strategies for launching new products on Amazon:
  - Mined historical data, followed by data cleansing for improved validity, consistency and uniformity; leveraged TFIDF numerical statistics for keywords extraction and latent semantic analysis (LSA); clustered semantic vectors using cosine similarity, allowing summarization of semantic themes; leveraged VADER, a parsimonious rule-based model for sentiment analysis of social media text.
  - Built an emotional tendency score model and performed regression in Stata to correlate customers' emotional score with rating stars of products.
  - Put forward metrics to measure product reputation and predict the corresponding quality; utilized LSA results to correlate product quality and design; modeled temporal evolution of reputation within Markovian framework.
  - Created recommendations for the company to manage product reputation and improve sales performance.

WORK EXPERIENCES

Computer Vision (CV) Engineer Intern
Suzhou Shuang-En Intelligent Technology Co., Ltd., China 06/2020 - 08/2020

- Assisted in building computer vision functions in C+ for face recognition, age detection, and gender classification:
  - Built a facial expression recognition framework based on a combination of local binary pattern and AdaBoost; enabled algorithm migration to Android and iOS platforms.
  - Built deep learning models in CAFFE framework for gender classification and age estimation, attaining overall accuracies of 92% and the Mean Absolute Error (MAE) of 4.6 years, respectively.
- Collaborated in a team-oriented environment across multiple researches and engineering disciplines, covering software engineers, data engineers, designers, program management, and quality assurance; worked on making architectural tradeoffs to efficiently deliver CV software solutions.

COURSE PROJECTS

Bearing Vibration Analysis Using Fast Fourier Transform
***Digital Signal Processing* Course Project, HDU** 09/2020 – 10/2020

- Developed a workflow for analyzing the vibration signals resulting from rolling element bearing for the diagnosis of machinery faults:
  - Designed, implemented and validated a digital signal processing workflow, covering signal acquisition, pre-processing, model training, testing, defect pattern detection and result verification.
  - Applied discrete cosine transform (DCT) and fast Fourier transform (FFT) for signal characterization.
  - Built, trained and validated a neural network model for defect classification, attaining 90%+ accuracy.