TeYang Lau

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WORK EXPERIENCE

Research Assistant | *Sleep & Cognition Laboratory, School of Medicine, NUS* **2018 – Present**

- Mined large HPB Fitbit longitudinal dataset that led to 2 applications for better understanding public health behavior and analyzing sleep variability
- Clustered >120k & analysed >300k days of Fitbit data from 1.8k+ individuals to identify 4 subgroups of Singapore working adults differentially susceptible to unhealthy behaviours during COVID-19
- Analyzed the effects of COVID-19 lockdown stringency on sleep and resting heart rate using ~113k individuals' Oura consumer wearable data across 20 countries; linear mixed effects models revealed increased lockdown stringency and lower sleep variability contributed to decreased resting heart rate
- Applied unsupervised ML clustering approaches over existing cosinor methods for studying rest-activity rhythms, improving model fit by Corr: 26%, RMSE: 12%
- Leveraged behavioral, cognitive and MRI techniques to investigate the effects of napping, which improves memory encoding by 20% and benefits brain functioning
- Collaborated with external government and industry partners (HPB, Oura) to explore best approach in mining datasets and structuring new projects
- Co-led 2 nap research projects, co-authored 4 peer-reviewed manuscripts, 3 of which were selected for Editor's Choice, and manage lab IT server and hardware

Research Intern | *Cognitive Neuroscience Laboratory, Duke-NUS Medical School* **2016 (6 Months)**

- Automated the visualization & computation of sleep poly-somnography that expedited the sleep report generation process by 50%
- Automated actigraphy scoring and extraction that led to reduced total process time by 30%

EDUCATION

Master of IT in Business Artificial Intelligence **Expected Completion: 2022**
Singapore Management University

BA Psychology (Honours) **2017**
Flinders University | 1st Class Honours

BA Psychology & Management **2014-2016**
Murdoch University | GPA: 3.75

- University Medal (Top 7 Graduates), Vice Chancellor's Commendation for Academic Excellence (2014, 2015), Psychology High Achievement Award

Certificates

- **Deep Learning Specialization** (Neural Networks, Optimization, Structuring ML Projects, ConvNets, Sequence Models); **AI for Medicine** (Diagnosis, Prognosis, Treatment); **Data Science** (Visualization, Probability)

SKILLS

- **Languages & Software:** Python, R, SQL, Matlab, Tableau, SPSS
- **Technical Skills: Machine Learning** (Regression, Classification, Bagging, Boosting, Clustering), **Neural Networks** (Deep Learning, ConvNets, RNN), **Libraries** (Scikit-learn, Tensorflow, PyTorch), **Statistical Analysis** (T-Test, ANOVA, Non-Parametric, Linear Mixed Models), **Data Science and Others** (Cleaning, Wrangling, Visualization, Hypothesis Testing, A/B Testing, Experimental Design, Git)

PROJECTS

Business and Consumer Analytics

- **Drivers of HDB Flat Resale Prices** | Links: GitHub , Interactive Web App
  - Analyzed 800k resale transactions to predict and identify the main drivers of resale price using linear regression and random forest with > 0.9 R^2 model fit and prediction MAE of $20k
  - Identified most important features/contributors to HDB resale prices using SHAP values
  - Performed web-scraping using public APIs to engineer new features that captured distance and number of amenities around each HDB flat
  - Deployed model on web app using Streamlit for user input HDB price prediction and amenities visualization

- **Google Games Recommender System - Ongoing** | Links: GitHub, Kaggle
  - Scraped ~7k games, ~ 8 million game reviews from google play store
  - Applied TF-IDF and LDA for topic modelling to engineer new features from game descriptions
  - Employed content-based filtering for recommending similar games and collaborative filtering (latent factor models) for predicting user game ratings
- **Chips Sales Customer Segmentation** | Links: GitHub, Kaggle
  - Explored customer transaction data to find insights on purchase behavior and identify groups to target for advertisements and promotions
  - Performed market basket and affinity analysis to identify customer segments that have affinity towards certain brands and product features

Computer Vision

- **Melanoma Detection** | Links: GitHub, Kaggle
  - Identified melanoma from skin lesion images using ensemble of EffNets and meta-data with AUROC of 93%
  - Explored different strategies for improving model performance (learning rate scheduling, label smoothing, test time augmentation)
- **Pneumonia Detection** | Links: GitHub, Kaggle
  - Detected pneumonia from chest x-rays using ConvNet (ResNet50) via transfer learning with F1-score of 92%
  - Used PyTorch as a framework for building the model on Kaggle's GPU
  - Experimented with gradient clipping and weight decay
- **Neural Style Transfer for Artistic Photos** | Links: GitHub, Kaggle
  - Generated artistic style photos in the style of other famous paintings using ConvNet by reducing the cost for the content and style of the generated image
- **Dog Breeds Classification** | Links: Kaggle
  - Classified 120 dog breeds using ConvNet and transfer learning with accuracy of 88%

Healthcare Analytics

- Public sleep intervention study to improve population sleep habits and hygiene (hiSG study with HPB)
- Time analyses of large-scale Fitbit data to engineer sleep features (variability metrics)
- Effects of napping duration on short- and long-term cognitive performance
- Variation of inactivity and activity rhythm according to chronotype and sleep quality
- **Heart Disease Prediction** | Links: GitHub
  - Predicted heart disease using different ML models (e.g., SVM, random forests) with best accuracy of 87%
  - Identified most important features/contributors using SHAP values

Natural Language Processing

- **Disaster Tweets Classification** | Links: GitHub, Kaggle
  - Classified real disaster tweets using different sequence models like LSTM, Bi-directional LSTM with attention, and transformers (BERT) with best accuracy of 84%
  - Performed text pre-processing to ensure suitable input into model and explored different word embeddings

PUBLICATIONS

- A longitudinal analysis of COVID-19 lockdown stringency on sleep and resting heart rate measures across 20 countries. (manuscript submitted to *Scientific Reports*). Ong JL, **Lau T**, et al.
- COVID-19 related mobility reduction: heterogenous effects on sleep and physical activity rhythms. *SLEEP,* 2020. Editor's Choice. Ong JL, **Lau T**, et al.
- A daytime nap restores hippocampal function and improves declarative learning. *SLEEP,* 2020. Editor's Choice. Ong JL, **Lau T**, et al.
- Cognitive effects of split and continuous sleep schedules in adolescents differ according to total sleep opportunity. *SLEEP,* 2020. Editor's Choice. Lo, JC, Leong RLF, …, **Lau T**, et al.
- Evaluation of a portable light device for phase advancing the circadian rhythm in the home environment. *Sleep Biol Rhythms,* 2018. **Lau T**, Lovato N, Lack, L.