

# Felix Bragman

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## Work Experience

### Medtronic, Surgical Robotics

Principal AI Scientist/Engineer 2021-present

- Researching and developing machine learning algorithms to process surgical videos:
  - Topics include: video instance segmentation, multi-task learning and transformer architectures
  - Developed a multi-task mixture of experts vision transformer to reduce latency (>30% parameter reduction) and improve performance (17% across tasks) for internal models
- Contributing production-ready code for R&D and deployment of models to the hardware team
- Responsible for the supervision of junior team members and UCL Machine Learning MSc students

### Babylon

Senior Research Scientist 2019-2021

- Led research on representation learning from medical data to power AI-assisted products
- Deployed a graph neural network (GNN) for learning patient embeddings from medical records to power internal products
- Developed a PyTorch toolkit for deep learning on medical time-series used throughout the company for internal R&D

### University College London

Research Associate in Machine Learning and Medical Image Computing 2017-2019

Supervisor: Dr. M. Jorge Cardoso

- Conducted fundamental research in deep multi-task learning:
  - Created Stochastic Filter Groups (SFG); a novel mechanism for probabilistic architecture search in multi-task learning (ICCV oral, top 4%)
  - Developed a novel multi-task objective function using Bayesian deep learning for spatially adaptive weighting of task losses (MICCAI oral, top 5%)
- Contributed to NiftyNet: an open-source TensorFlow library for medical image analysis

## Education

### University College London

Ph.D. in Computer Vision 2012-2017

Quantitative lung CT analysis for the study & diagnosis of COPD

Supervisors: Prof. David J. Hawkes and Prof. John Hurst

- Developed supervised and unsupervised learning methods for the study and diagnosis of lung disease from 3D Computed Tomography scans
- Published at top technical (MICCAI and IEEE Transactions on Medical Imaging) and high ranking medical journals (American Journal of Respiratory & Critical Care Medicine, 11% acceptance rate)

### University of Oxford

M.Sc. with distinction in Biomedical Engineering (ranked 1st in class) 2011-2012

### University College London

B.Eng. first class honours in Mechanical Engineering (Dean's List) 2007-2011

## Academic Activities

### Reviewer

NeurIPS, ICML, ICLR, MICCAI, MIDL and IEEE Transactions on Medical Imaging

### Program Committee

UNSURE workshop on Uncertainty and Safety in Medical Imaging at MICCAI 2019, 2020, 2021

DART workshop on Domain Adaptation and Representation Transfer at MICCAI 2019

## Selected Publications

### ICCV - 2019 (oral) - top 4.3% of 4,303 submissions

Stochastic filter groups for multi-task CNNs: learning specialist and generalist convolution kernels  
<https://arxiv.org/abs/1908.09597>

- Novel method that learns task-specific and shared representations for multi-task learning
- Developed Stochastic Filter Groups modules; a probabilistic grouping of kernels that help learn the CNN architecture
- Optimisation enabled through variational inference to learn the posterior distribution over possible groupings of kernels and network parameters

### MICCAI - 2018 (spotlight oral & travel award) - top 5% of submissions

Uncertainty in multitask learning: joint representations for probabilistic MR-only radiotherapy planning  
<https://arxiv.org/abs/1806.06595>

- Developed a multi-task learning method that learns to dynamically weight the loss function using heteroscedastic uncertainty
- Method is based on Bayesian deep-learning to estimate uncertainty in the neural network
- Applied method to simultaneous MR to CT synthesis and organ-at-risk segmentation

### IEEE Transactions on Medical Imaging - 2017

Pulmonary lobe segmentation with probabilistic segmentation of the fissures and a groupwise fissure prior  
<https://ieeexplore.ieee.org/document/7903649>

- Lung segmentation from three-dimensional Computed Tomography (CT) scans
- Developed an unsupervised lung fissure segmentation method based on Gaussian Mixture Modelling and Markov Random Field regularisation
- Lobe segmentation was performed using the fissure segmentation and a population model of the fissures

### MICCAI - 2017

Manifold Learning of COPD

<https://discovery.ucl.ac.uk/id/eprint/10042862/1/paper332.pdf>

- Developed a novel method to analyse disease progression of COPD from CT scans
- Created of a novel descriptor of disease severity to quantify patterns of tissue classification
- Performed manifold fusion of separate manifolds of COPD phenotypes learnt using Isomap
- Kernel regression to identify trajectories of disease progression to better monitor disease progression

## Selected Awards

### MIDL Honorable Mention Reviewer Award

Medical Imaging with Deep Learning conference  
Awarded to the top reviewers at the conference

2020, 2021

### MICCAI Reviewer Award

Medical Image Computing and Computer Assisted Interventions conference  
Awarded to top reviewers at the conference

2019

### MICCAI Travel Award

Medical Image Computing and Computer Assisted Interventions conference  
Awarded to 50 researchers

2018

### British Lung Foundation Travel Award

European Respiratory Society conference  
Awarded to early-career clinical/non-clinical researchers in the respiratory field

2014

### The Professor Sir Michael Brady Prize

University of Oxford, Department of Engineering Science  
Awarded for overall best performance in the M.Sc. in Biomedical Engineering

2012

### University College London Dean's List

University College London  
Awarded for achieving a degree average of at least 75%

2011