

Han Peng

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EDUCATION

2014 – 2018 University of Oxford

DPhil (PhD) in Condensed Matter Physics

Advisor: Prof Yulin Chen

Thesis title: Spatial resolved electronic structure of low dimensional materials and data analysis

2010 – 2014 University of Science and Technology of China (USTC)

Bachelor of Science in Applied Physics

APPOINTMENTS

2018 – Now Postdoctoral Researcher

Visual Geometry Group (VGG) AND Oxford Centre for fMRI and Brain (FMRIB)

University of Oxford, United Kingdom

Donders Institute for Brain, Cognition and Behaviour

Radboud University, Netherlands

RESEARCH

2018 – Now Postdoctoral project: Deep Medicine

Advisor: Prof Stephen Smith *Oxford Centre for Functional MRI and Brain, Oxford*

AND **Prof Andrea Vedaldi** *Visual Geometry Group, Department of Engineering Sciences, Oxford*

AND **Prof Christian Beckmann** *Donders Institute for Brain, Cognition and Behaviour, Radboud*

Deep Learning in age prediction for MRI brain images

Using convolutional neural network to predict age with 14,503 MRI brain images in UK Biobank dataset. Exploring biological and pathological meaning of brain age.

Keeping world record of brain age prediction accuracy. Won first places for all of the two awards in Brain Age Prediction Challenge (PAC 2019. Team: BrainAgeDifference), out of 79 participating teams worldwide. Manuscripts under preparation. See <https://www.photon-ai.com/pac2019>

2014 – 2018 PhD Project: Electronic Properties of Quantum Materials

Advisor: Prof Yulin Chen *Clarendon Laboratory, Department of Physics, University of Oxford*

Machine learning in ARPES data analysis

Used convolutional neural network to identify the physical features in the spectrum images. The project is developed using MATLAB, Python and TensorFlow

Twisted bilayer graphene

Used Angular Resolved Photo-Emission Spectroscopy (ARPES) with Micrometre resolution to study electronic properties of twisted bilayer graphene

Data analysis software development

Led the development of data analysis system for spectrum image data processing.

There are 30 users, 4 regular contributors and 10 interns throughout the years. The work includes algorithm optimisation, data visualisation and graphic user interface building

2017 Research Intern: Data Processing in Two-photon Imaging

Advisor: Prof Kenneth Harris *Cortical Processing Laboratory, University College London*

Neuron Image Registration

Designed fast registration algorithm with register ex-vivo 2D-slices and in-vivo 3D-volume data of neuronal images with different modality and recording methods.

Analysis Pipeline Development

Developed semi-automatic MATLAB data analysis pipeline for the registration algorithm. The pipeline includes data I/O, cell detection, registration, result visualisation and manual modification interface. Project GitHub page: <https://git.io/vAjk4>

TEACHING

2015 – 2018 Demonstrator (Senior Demonstrator since 2017) in **Computational Physics**, University of Oxford

2017 – 2018 Tutor in **Mechanics**, Jesus College, University of Oxford

2016 – 2017 Tutor in **Condensed Matter Physics**, Hertford College, University of Oxford

AWARDS

2015 Arthur H. Cooke Memorial Prize awarded by Department of Physics, University of Oxford

TALKS AND PRESENTATIONS

2019.06 **Deep Learning for Accurate Brain Age Prediction from 14503 UK Biobank T1 Images**

Poster presentation in *OHBM 2019, Rome, Italy*

2019.03 **Super Resolution Convolutional Neural Network for Feature Extraction in Spectroscopic Data**

Oral presentation in *APS March meeting 2018, Boston, MA, US*

2018.03 **Van hove singularity evolution with twist angle in twisted bilayer graphene**

Oral presentation in *APS March meeting 2018, Los Angeles, CA, US*

2017.11 **Register 2D neuron image with 3D data**

Oral presentation in *Neuromics project annual retreat 2017, Washington D.C, US*

SELECTED PUBLICATIONS

Total citation: 1870 | h-index: 7 (Jun 2019) | Google Scholar page: <https://goo.gl/vINvHL>

Data analysis

1. **H. Peng**, X. Gao, Y. He, Y. W. Li, Y. C. Ji, C. H. Liu, S. A. Ekahana, D. Pei, Z. K. Liu, Z. X. Shen, Y. L. Chen "Super Resolution Convolutional Neural Network for Feature Extraction in Spectroscopic Data" *Manuscript ready*
2. C. Chen, M. X. Wang, J. X. Wu, Y. Sun, H. F. Yang, Z. Tian, T. Tu, **H. Peng**, G. Li, H. X. Fu, X. Xu, J. Jiang, N. B. M. Schroeter, Y. W. Li, D. Pei, S. Liu, S. Ekahana, H. T. Yuan, J. M. Xue, Z. K. Liu, B. H. Yan, H. L. Peng and Y. L. Chen "Electronic Structures of a High-Mobility Layered Oxychalcogenide Semiconductor, Bi₂O₂Se" *Science Advances*, **4 (9)**, eaat8355 (2018)
3. S. L. Zhang, W. W. Wang, D. M. Burn, **H. Peng**, H. Berger, A. Bauer, C. Pfleiderer, G. van der Laan, T. Hesjedal "Manipulation of skyrmion motion by magnetic field gradients" *Nature Communications*, **9 (1)**, 2115 (2018)

Graphene

4. **H. Peng**[†], N. B. M. Schröter[†] (equal contribution), J. B. Yin, H. Wang, T.-F. Chung, H. F. Yang, S. Ekahana, Z. K. Liu, J. Jiang, L. X. Yang, T. Zhang, C. Chen, H. Ni, H. Barinov, Y. P. Chen, Z. F. Liu, H. L. Peng, Y. L. Chen "Substrate Doping Effect and Unusually Large Angle van Hove Singularity Evolution in Twisted Bi- and Multilayer Graphene" *Advanced Materials* (2017)
5. J. B. Yin[†], H. Wang[†], **H. Peng**[†] (equal contribution), Z. J. Tan, L. Liao, L. Lin, X. Sun, A. L. Koh, Y. L. Chen, H. L. Peng, and Z. F. Liu "Selectively enhanced photocurrent generation in twisted bilayer graphene with van Hove singularity" *Nature Communications*, **7**, 10699 (2016)
6. L. Liao, H. Wang, **H. Peng**, J. B. Yin, A. L. Koh, Y. L. Chen, Q. Xie, H. L. Peng, and Z. F. Liu "van Hove Singularity Enhanced Photochemical Reactivity of Twisted Bilayer Graphene" *Nano Letters*, **15**, 5585 (2015)

Other quantum materials

7. J. Jiang, Z. K. Liu, Y. Sun, H. F. Yang, R. Rajamathi, Y. P. Qi, L. X. Yang, C. Chen, **H. Peng**, C.-C. Hwang, S. Z. Sun, S.-K. Mo, I. Vobornik, J. Fujii, S. S. P. Parkin, C. Felser, B. H. Yan, Y. L. Chen "Signature of type-II Weyl semimetal phase in MoTe₂" *Nature Communications*, **8**, 13973 (2017)
8. Z. K. Liu, L. X. Yang, Y. Sun, T. Zhang, **H. Peng**, H. F. Yang, C. Chen, Y. Zhang, Y. F. Guo, D. Prabhakaran, M. Schmidt, Z. Hussain, S.-K. Mo, C. Felser, B. Yan and Y. L. Chen "Evolution of the Fermi surface of Weyl semimetals in the transition metal pnictide family" *Nature Materials*, **15**, 27 (2016)
9. L. X. Yang, Z. K. Liu, Y. Sun, **H. Peng**, H. F. Yang, T. Zhang, B. Zhou, Y. Zhang, Y. F. Guo, M. Rahn, D. Prabhakaran, Z. Hussain, S.-K. Mo, C. Felser, B. Yan and Y. L. Chen "Weyl Semimetal Phase in non-Centrosymmetric Compound TaAs" *Nature Physics*, **11**, 728 (2015)
10. Z. K. Liu, J. Jiang, B. Zhou, Z. J. Wang, Y. Zhang, H. M. Weng, D. Prabhakaran, S. -K. Mo, **H. Peng**, P. Dudin, T. Kim, M. Hoesch, Z. Fang, X. Dai, Z. X. Shen, D. L. Feng, Z. Hussain, Y. L. Chen. "A Stable Three-dimensional Topological Dirac Semimetal Cd₃As₂" *Nature Materials*, **13**, 677 (2014)