- **Name of supervisor(s)**

  He Wang (primary), potential supervisors (Anthony Steed, Niloy Mitra, Tobias Ritschel)

- **Research project title**

  Fast Digital Avatar Creation

- **Research subject area keywords**

  Computer Graphics, Computer Vision, Machine/Deep Learning.

- **Project description**

  Digital avatar creation aims to build high fidelity digital copies of humans, which is in fast growing demand in areas such as metaverse, computer-aided design, healthcare, virtual/augmented/mixed reality, etc, with a market surging to $936.6 billion by 2030 (Statista). However, creating such avatars requires expensive equipment, years of experience, time-consuming trial-and-error processes, essentially establishing a high entry barrier for content creators. The project aims to significantly lower this barrier.

  The major challenges involves creating 3D bodies, clothing and realistic motions and behaviours, which corresponds to rendering, geometric modeling and animation, three key subareas of Computer Graphics. This PhD project focuses on developing new animation techniques for motions and behaviours, combining new approaches in computer graphics, deep learning and computational physics. Specifically, it provides three related lines of potential research topics: character animation, garment simulation and crowd simulation, from which the PhD candidate is free to choose.

  Character Animation: while existing research mostly focuses on single character animation, this project will focus on creating natural motions for close character-character interactions and character-environment interactions. How to analyse data (e.g. videos of wrestling), and learn the motions for controllable motion synthesis is one example topic. Here is one example for our current research (https://www.youtube.com/watch?v=HigyJr5y_Iw)

  Garment Simulation: deviating from the current research which largely focuses on fast simulation and artistic creation, this project will look into digitalisation of real fabrics and garments, aiming for high fidelity cloth models. This looks into combining deep learning with computational physics models to solve various inverse problems (e.g. computing desired material properties to match a given fabric behaviour). Here is one example for our current research (https://www.youtube.com/watch?v=pCB8AD9R4Dk)

  Crowd Simulation: this project will focus on learning realistic behaviours from crowd data and develop models that can accurately predict/simulate crowd motions. Here is one example for our current research (https://www.youtube.com/watch?v=F3Cmprhyy0M)

- **Supervisory Team (max 200 words)**

The supervisory team is mainly based in the Virtual Environment and Computer Graphics (VECG) team. The primary supervisor is Dr He Wang, an Associate Professor specialising in computer animation. The project will also be potentially (depending on the chosen topic) co-supervised by Prof Anthony Steed (VR), Prof Niloy Mitra (Geometric Processing) and Prof Tobias Ritschel (Rendering), covering all aspects of Computer Graphics needed for this project with a strong track record in research.

Dr Wang has more than 15 years of research experience, and regularly publish in top-tier venues in computer graphics, computer vision and machine learning, such as SIGGRAPH, SIGGRAPH Asia, CVPR, ICCV and ICLR. He also broadly collaborates with people from other fields in highly interdisciplinary projects, in physics, engineering, design, biology, medicine, etc. and publish in high-standard venues such as Science Advances. He has extensive PhD supervision experience, and has supervised nearly 40 PhDs and multiple post-docs. He also worked in industry including Disney Research and has wide collaborations with established groups in the US, Europe and China.