

## IBEX Summer Internships

IBEX is pleased to announce that we are recruiting 4 summer interns starting in Summer 2022. Our paid interns work for up to 12 weeks over the summer months on exciting technology or market related projects that directly impact ongoing innovation, product and market development activities. Current projects include those listed below.

### **Simulation Toolkit Development, Improving UI and UX Research and Development - AI**

Monte Carlo simulation of X-ray transmission and scatter in materials is a core element of the Trueview product. This project will build on our existing graphical tool to create new simulations by improving the UI, UX and adding several features to tailor the tool to the clinical use case

How the project will impact IBEX:

- More robust and streamlined simulation toolbox for general use
- More efficient use of the existing kernel database (e.g. searchable for similar configurations and ranges).
- Simplified configuration of new systems, including clinical features such as beds and compression paddles
- Automated capture of existing simulations, removing current user responsibility for storage
- Overhaul of spectra precomputation, improving accuracy and preventing user error

What you will work on:

- Migration of simulation tool to IbexSim, the simulation code repository
- Rewrite of code to verify available pre-computed spectra with python
- Geometry configuration user interface redesign with Tkinter
- Automation to add to kernel management database following simulation completion, using bash scripting
- Upgrade to MongoDB system for existing simulation management to enable search, intelligent storage (mongoDB, SQL)
- Implement a system to ensure quality, low noise simulation in the (c++)
- Redesign of spectra pre-computation to remove scatter within the scintillator (c++)

### **Automatic Exposure Controls, Mammography Enhancements Research and Development – Core Algorithm**

AEC is a critical tool for managing the patient dose in Mammography. An initial probe shot is taken at low dose so that the most dense regions can be found and a dose selected which maximises the image quality without compromising patient safety. Existing AEC algorithms assume there is a grid present. In gridless mode AEC is complicated by the overall increase in scattered intensity and the change in intensity distribution across the field of view. This project will identify one or more methods of compensating for the scatter profile in a gridless probe shot so standard AEC algorithms can be utilised.



How the project will impact IBEX:

- Removes or reduces one of the barriers to implementing Trueview in a Mammography system.
- Improves our ability to bring Trueview to market.

What you will work on:

- Establish scatter profile characteristics for a wide range of typical mammography images (clinical and phantom) using SRM
- Investigate and implement methods for minimising the impact of scatter on low intensity images through a combination of image post processing and statistical techniques.

## **Mammography image segmentation Research and Development – Core Algorithm**

Building on our existing image segmentation techniques this project will extend the capability to robust detection of dense objects including needles, markers and implants. Performance characteristics and limits for the existing methods will also be investigated and improved if possible

How the project will impact IBEX:

- More robust generic Mammography product
- Extended performance capabilities
- Potentially an image characteristic based selection of spatial model settings

What you will work on:

- Implementation of a robust method for segmenting metal objects in SRM (e.g. double Otsu method)
- Establishing performance metrics and test criteria for mammography segmentation
- Investigating methods for quickly identifying typical image characteristics (intensity distributions, shapes etc)

## **AI Denoise Methods: Research and Development – AI**

This project would utilise innovative AI-technologies and apply them to CT reconstruction methods. We have already seen amazing results applying general-purpose AI-denoise techniques to raw CT frames, and believe that building a deep-learning algorithm specifically designed to denoise DR images would lead to further improvements to CT reconstructions, both in terms of quality and consistency. Such an AI-supported reconstruction engine has the potential to be truly state of the art. This R&D work would also benefit multiple areas of the company, for instance, these algorithms could also be applied to general-purpose DR images, further expanding IBEX's image quality toolkit.

How the project will impact IBEX:

- Significantly improved reconstruction image quality (CE, recon product)
- Development of novel denoise capability using deep learning (AI Team)



- Deeper understanding of noise (RmW)
- Enhance DRR (V3+)

What you will work on:

- Managing/running XIST simulations to support project
- Investigating the “nature of noise” to gain insights into denoising
- Working on a report of our findings to document the development process

## **Future Bone Health (KCL Students only)**

### **Research and Development – AI**

Following on from a successful student-led engagement with KCL through the ChallEng project, several good candidates exist for a project to look in more depth into additional bone health metrics beyond bone thickness.

The internship would focus around a single additional metric, provisionally based on Digital X-ray Radiogrammetry (DXR) due to the body of evidence in the literature. Producing a statistically robust proof that DXR can be applied to wrist DR is possible using the results from the Exeter clinical trial; and this paves the way to “defend and extend” the trueview product by incorporating a non-intensity based, orthogonal, fracture prediction metric.

How the project will impact IBEX:

- Provide a beyond PoC, robust, result that DXR can be applied to the Trueview bone health product to either improve accuracy or increase the reach of the product.
- Help develop a DXR automation crucial for the end product

What you will work on:

- Help develop a DXR automation crucial for the end product (data annotation protocols, deep learning testing)
- Developing and reporting a statistical hypothesis.
- Combining DXR with Trueview bone thickness through modelling.

If you are interested in applying for the internships, please contact our HR Manager, Maxine Henry for more information. [m.henry@ibexinnovations.co.uk](mailto:m.henry@ibexinnovations.co.uk)

