One PhD position in:

Human visual processing of complex real-world information

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Visual processing is often described as an assembly line whereby simple image features, such as the edges and lines that are detected by early stages of the visual system, are subsequently combined to produce multi-segment elements such as corners, and corners are further combined to construct representations of geometrical shapes, until this process culminates in the representation of objects somewhere down the line of the visual processing hierarchy. Recent evidence, however, has challenged this view and has instead put forward the notion that global representations of the world, such as the overall gist of the scene in front of us, can impact early detection of elementary image features: our visual experience of the world cannot be broken down into increasingly simpler calculations, as one would go about solving a simple algebraic problem, but rather requires that the entire experience is conceived at once as a complex multi-level entity with no clear hierarchical structure. Understanding this structure will be the subject of your PhD.

To study the problematic above in the laboratory using quantitative tools, you will be implementing highly controlled experiments in virtual and/or augmented reality (AR/VR). The adoption of AR/VR tools will make it possible to achieve near-natural visual experiences that are sufficiently rich and compelling to approximate real-world vision, while at the same time allowing for the kind of fine control of the visual input that is necessary to perform rigorous experimentation.

To get an idea of the type of measurements that we carry out in the lab and the class of computational models that we use to capture the experimental results, you can refer to the following publications:

https://jov.arvojournals.org/article.aspx?articleid=2793425

https://journals.plos.org/plosbiology/article?id=10.1371/journal.pbio.1002611

https://drive.google.com/file/d/19RJ9MenRcL_v4Yj8Xwj62IvCGxezJMEZ/view

You should be comfortable with quantitative subjects (e.g. maths, statistics), and ideally have at least some experience with computer programming. It is essential that you enjoy coding, because this PhD project will involve a lot of it, potentially spanning different languages (e.g. python, C#, javascript) and platforms (e.g. Pytorch, Unity3D).

For any enquiry, please contact Peter Neri directly via email (peter.neri@iit.it)