Who We Are
A spin-out from Imperial College London, the R&D Group @ Cortexica has been operating for over 10 years, it now comprises of 30+ research scientists and engineers with a variety of backgrounds; from computer vision, machine learning, neuroscience to astrophysics and medical imaging.

The group has expertise in various Artificial Intelligence, Deep Learning, Machine Learning, Geometric and Statistical techniques. This drives sophisticated AI solutions for our clients and simply put; “World-class best-of-breed technology”. This results in delivering the fastest, most-efficient and highest accurate capabilities for both image and video comprehension available today.

Ecosystem - Partners & Grants
We believe no one party can solve this alone and have strategic partnerships with several industry and public sector partners. Our Global 2000 clients and partnership grants in affect steer a large portion of the group's research agenda.

Publications
Cover well-known journals (PAMI, JOSA, Phys Rev E, PloS Computational Biology/Biology, Neuroimage, Royal society journals, etc.) and respected conferences such as NIPS, CoSyNe, AISTATS, ECCV, ICCV, etc. The group is structured into, i) Applied, and ii) Theoretical teams, with a commercial focus and support for our clients’ AI roadmaps.

Applied Research
- **Infrastructure Optimization**
Utilizing differential geometry, we have shown how rankings on a set of such images can be improved by using Wasserstein distances. Further on, bringing on ideas from tensor factorization, we have shown that these images can be encoded to save storage footprint along with producing encodings that have at par retrieval performance as that demonstrated by advanced methodologies such as Fisher encodings.

- **Ranking of Images**
On the very end of applied research, we have productized a deep learning based recommendation framework that can provide suggestions to end-users based on their personal preference of colour, texture, style for a variety of apparels.

- **Video Behavioural Analysis**
Our “pillar networks” for video based action recognition have demonstrated state-of-the-art predictions on data-sets that have varying camera viewing angles, video quality, etc.

Theoretical Research
- **Hybrid approach combining Differential Geometry with Statistical Bayesian techniques**
Our ICML workshop papers have concentrated on fusing differential geometry based parallel transport with variational Bayes, apart from coming up with a Bayesian belief updating scheme to predict spatiotemporal dynamics such as seizures that originate in the cortex of epileptic patients.

- **Reinforcement learning for human decision making**
In other unpublished work, we have looked into active inference, a neuroscience aided reinforcement learning framework, for agents that are spread on a spatiotemporal field – using PDE analysis and optimal transport theory. This has significant consequences for reinforcement learning, deep and otherwise, which has always ignored the spatial structures of agents.
Workshops

   https://arxiv.org/abs/1710.07035

   https://arxiv.org/abs/1705.09451

   https://arxiv.org/abs/1703.06324

   https://arxiv.org/abs/1705.07278

5. B. Sengupta and K.J. Friston “Approximate Bayesian inference as a gauge theory” Proceedings of ICML 2017 (Computational Biology workshop) – spotlight presentation
   https://arxiv.org/abs/1705.06614


8. V. Simaiaki, A. Mirabile and E. Vazquez “Flower identification on species level with uneven classes and few images” BMVA 2017 Plants in Computer Vision workshop

Pre-prints

1. A. Bay and B. Sengupta “Approximating meta-heuristics with homotopic deep recurrent neural networks”

2. B. Sengupta and Y. Qian “Pillar Nets++: Distributed non-parametric deep and wide networks”
   https://arxiv.org/abs/1708.06250

   https://arxiv.org/abs/1702.06383

   https://arxiv.org/abs/1703.02898

5. B. Sengupta and K.J. Friston “Sentient Self-Organization: Minimal dynamics and circular causality”
   https://arxiv.org/abs/1705.08265