

# NETWORKED NEUROSURGERY

## Summary

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Addressing the challenges to society for a more efficient healthcare and for more informed citizens, the research project *Networked Neurosurgery* explores the potential of the Future Internet for improving and expanding the scope of neurosurgical treatment. The project aims to develop new knowledge and technical innovations for a networked Augmented Reality/Virtual Reality System, with a view to (i) optimizing the collaborative performance of neurosurgical operating teams; (ii) increasing the accuracy of preoperative planning; (iii) heighten the efficiency of neurosurgical training; and (iv) improving surgeon-patient communication, empowering patients to make more informed decisions about treatment options. To pursue these goals, the project will develop a networked AR/VR interface architecture that provides a more intuitive user interface and that allows a seamless integration of anatomical, pathological and functional image/patient data. The networked interface architecture will support social communication tools (social networks) that allow sophisticated forms of cooperation and collective sharing of data. More precisely, the project will develop new networked software components for neurosurgery, such as (i) a networked brain atlas, (ii) an online and offline simulator for neurosurgical training, and (iii) an interconnected monitoring component (the Internet of Things), turning the operating room into a smart environment. Potentially, versions of the system could be exploited for purposes of general public education. The project is interdisciplinary and adheres to the principles of socially robust and responsible innovation, which are gaining ground internationally and which flow from the idea that science should not be cut off from the rest of society. Through a set of innovative and participatory methods, the project allows society (including end-users, humanities/social science researchers and artists) to enter the research phase of technological innovation.

## Primary and secondary objectives

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The primary objective of the project is (1) to explore the potential of the Future Internet for improving and expanding the scope of neurosurgical treatment through developing a networked neurosurgery Augmented Reality/Virtual Reality system, with a view to optimizing the collaborative performance of neurosurgical operating teams; increasing the accuracy of preoperative planning; heighten the efficiency of neurosurgical training; and improving surgeon-patient communication. To pursue this goal, the project will develop a networked AR/VR interface, which includes a networked brain atlas, an online and offline simulator, and an interconnected monitoring component. Secondary objectives are: (2) to develop research methods that ensure responsible innovation; (3) to obtain a comprehensive grasp of ethical and sociocultural issues relating to sharing of networked patient data; and (4) to pursue untraditional and creative routes of innovation.