# Fundamental Neuroscience for Neuroimaging

Module 1: Introduction

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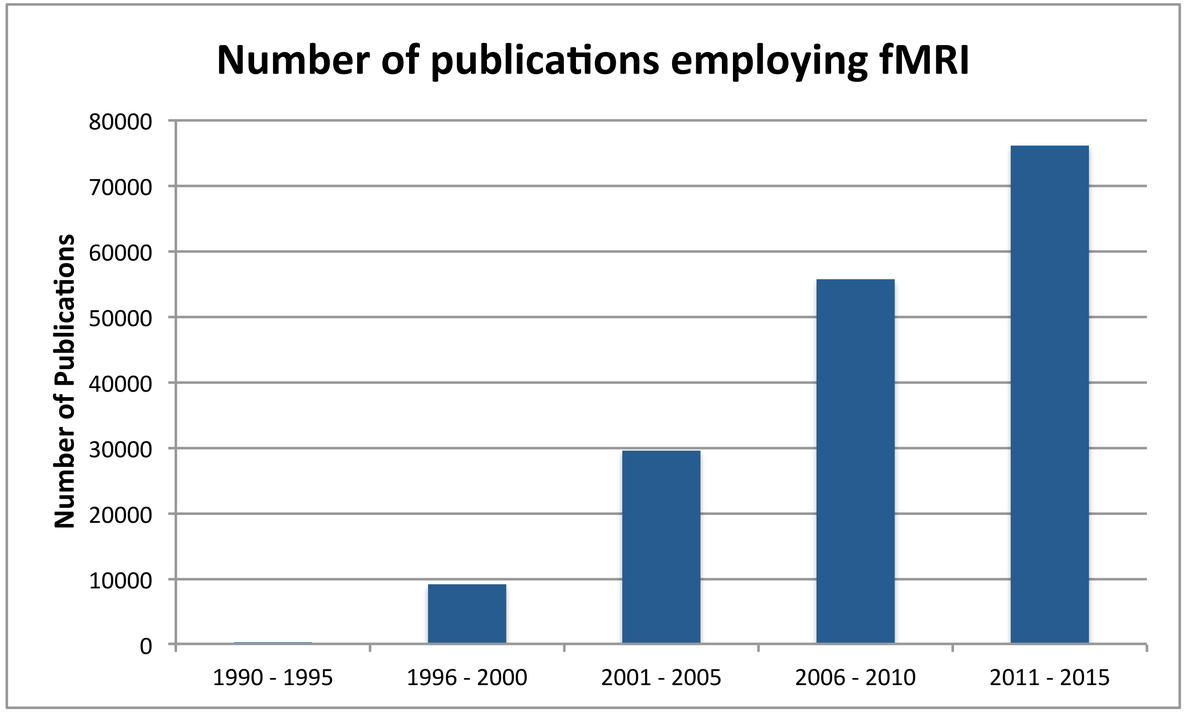
# Course Introduction

Since the advent of magnetic resonance imaging the use of this imaging method in biomedical research has grown rapidly with over 16,000 publications reporting on this method just in 2014

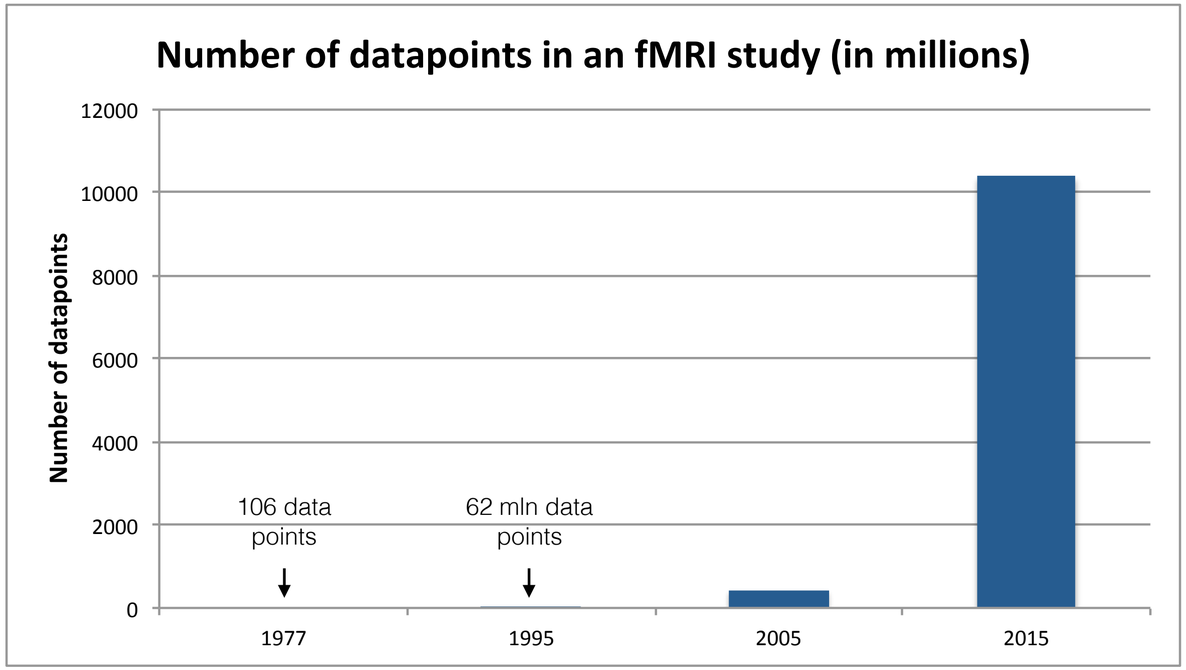



Number of publications with topic fMRI according to ISI Web of Knowledge

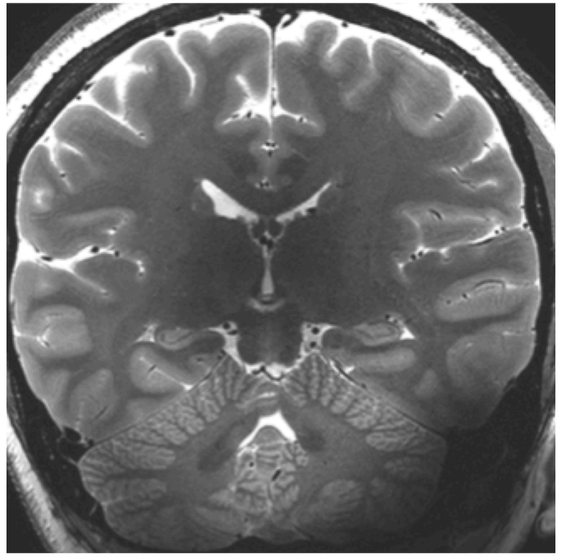

Top: First magnetic resonance imaging scanner. Bottom: First MRI scan of the torso showing heart and lungs

# Course Introduction

Studies using MRI initially consisted of just a few data points but datasets quickly grew to include hundreds of subjects and billions of data points.




Number of data points in a typical fMRI study increases exponentially with the advancement of MRI technology and analysis methods

Top: Modern magnetic resonance imaging scanner. Bottom: High-resolution 7T MRI scan of the human brain

# Course Introduction

The analysis of modern neuroimaging data is a true Big Data problem.

# Course Introduction

Course goal:

To provide an overview of neuroscience topics relevant to the collection, analysis and interpretation of neuroimaging data.

# Course Introduction

Neuroscience:

Multidisciplinary study of the biological basis of behavior.

Disciplines:

- Neuroanatomy
- Neurochemistry
- Neurophysiology
- Neuropsychology

Branches:

- Molecular Neuroscience
- Cognitive Neuroscience
- Clinical Neuroscience
- Computational Neuroscience
- Developmental Neuroscience
- Cultural Neuroscience

# Course Introduction

Neuroimaging: A collection of methods to image the structural, functional and chemical properties of the central nervous system.

Disciplines:

- Neuroanatomy
- Neurochemistry
- Neurophysiology
- Neuropsychology

Branches:

- Molecular Neuroscience
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# Course Introduction

Course topics:

- Structural and functional organization of the brain
- Terminology in brain organization
- Brain networks and communication in the brain
- Cognition and cognitive domains
- Principles of Magnetic Resonance Imaging
- Neuroimaging methods
- Experimental design and neuroimaging studies

# Module 2: Structural Anatomy of the Human Brain

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