Common Image Processing Techniques 1

Semester 2 / January 20 Credits

Each Course is composed of Modules & Activities.

Modules:
- Measure Lesion Size
- Assess Volume Qualitative
- Assess Volume Quantitative
- White Matter Lesion Rating – Qualitative
- White Matter Lesion Rating – Quantitative
- Multi-centre studies and combing data sets

Each Module is composed of Lectures, Reading Lists, MCQ self-assessments, & Discussion Boards.

These Modules are taught on the following Programmes, or are incorporated into blended Courses which teach students enrolled outwith the Edinburgh Imaging Academy:
- NI4R - Neuroimaging for Research programme
- IMSc - Imaging programme
Modules:

**Measure Lesion Size:**
Measurement

**Assess Volume Qualitative:**
Assessing whole brain volume
Assessing regional brain volumes

**Assess Volume Quantitative:**
Volumetric measurement principles
Whole brain volume, ventricular volume and intracranial area measurement
Temporal lobes and amygdalohippocampal volume measurement

**White Matter Lesion Rating – Qualitative:**
An introduction to white matter lesions
MR white matter lesion rating scales – Part A
MR white matter lesion rating scales – Part B

**White Matter Lesion Rating – Quantitative:**
Quantitative assessment – approaches and limitations
Individualising and semiautomating thresholding

**Multi-centre studies and combining data sets:**
Methods for combining large image datasets
Measure Lesion Size

Lecture 1
Title: Measurement
Description: Principles and problems
Author(s): Dr. Andrew Farrall
Learning Objectives
- Outline how and why measurements are made from radiological images
- Describe the different sources of error which affect measurements

Assess Volume Qualitative

Lecture 1
Title: Assessing whole brain volume
Description: Methods for assessing whole brain volume
Author(s): Prof. Joanna Wardlaw, Dr. Karen Ferguson
Learning Objectives
- Recognise common patterns of brain volume loss with age
- Outline the principles of rating volume loss using scales
- Describe specific scales
- Rate scans using the scales

Lecture 2
Title: Assessing regional brain volumes
Description: Methods for assessing regional brain volumes
Author(s): Prof. Joanna Wardlaw, Dr. Karen Ferguson
Learning Objectives
- Recognise patterns of focal brain atrophy
- Outline methods of rating regional volume loss
- Describe several specific scales
- Apply these scales to rating scans
- Discuss differences between quantitative and qualitative scales and why this may be important in research and clinical practice
Assess Volume Quantitative

Lecture 1
Title: Volumetric measurement principles
Description: General principles behind measuring brain volume
Author(s): Dr Karen Ferguson, Prof. Joanna Wardlaw
Learning Objectives
- Outline the general approach to measuring brain volumes quantitatively

Lecture 2
Title: Whole brain volume, ventricular volume and intracranial area measurement
Description: Steps involved in measuring whole brain volume
Author(s): Dr Karen Ferguson, Prof. Joanna Wardlaw
Learning Objectives
- Describe how to measure whole brain volumes, ventricular volumes quantitatively and intracranial area as a proxy for intracranial volume

Lecture 3
Title: Temporal lobes and amygdalohippocampal volume measurement
Description: Steps involved in measuring temporal lobes and amygdalohippocampal volume
Author(s): Dr Karen Ferguson, Prof. Joanna Wardlaw
Learning Objectives
- Describe how to measure temporal lobe and amygdalohippocampal volumes quantitatively
White Matter Lesion Rating – Qualitative

Lecture 1

Title: An introduction to white matter lesions
Description: Types of white matter lesions and methods of quantifying them
Author(s): Joanna Wardlaw, Karen Ferguson, with assistance from Susie Shenkin

Learning Objectives
- Describe age-related white matter changes, including variation in type and appearance
- Outline what they are associated with and their causes
- Recognise the different types of white matter lesions on brain images
- Briefly outline rating scales used for white matter lesion rating

Lecture 2

Title: MR white matter lesion rating scales-Part A
Description: A description of commonly used MR scales for quantifying white matter lesions with examples
Author(s): Joanna Wardlaw and Karen Ferguson

Learning Objectives
- Describe different MR scales used for rating WML
- Rate WML using these scales
- Discuss the principles of subjective rating of any imaging feature
- Explain ceiling and floor effects

Lecture 3

Title: MR white matter lesion rating scales-Part B
Description: A description of commonly used MR scales for quantifying white matter lesions with examples
Author(s): Joanna Wardlaw and Karen Ferguson

Learning Objectives
- Describe different MR scales used for rating WML
- Describe scales that can be used with CT or MR
- Describe scales that can be used to rate change in white matter lesions over time
- Compare scales
- Rate WML using these scales
White Matter Lesion Rating – Quantitative

Lecture 1
Title: Quantitative assessment- approaches and limitations
Description: Outlining quantitative approaches to white matter lesion rating
Author(s): Prof. Joanna Wardlaw
Learning Objectives
- Outline several approaches to measuring white matter lesion volume quantitatively
- Discuss problems with these approaches
- Analyze relative merits of quantitative vs qualitative approaches

Lecture 2
Title: Individualising and semi-automating thresholding
Description: Approaches being used locally to improve the volume measurement
Author(s): Prof. Joanna Wardlaw
Learning Objectives
- Outline several approaches to improve the quantitative volume measurement
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www.ed.ac.uk/edinburgh-imaging

Multi-centre studies and combining data sets

Lecture 1
Title: Methods for combining large image datasets
Description: The need for methods to combine image data from multiple subjects and scanners, problems encountered and methods for overcoming these.
Author(s): Dr. Dominic Job

Learning Objectives
- Describe reasons for combining image datasets
- Describe the range of problems encountered
- Outline current and developing methods for overcoming these problems