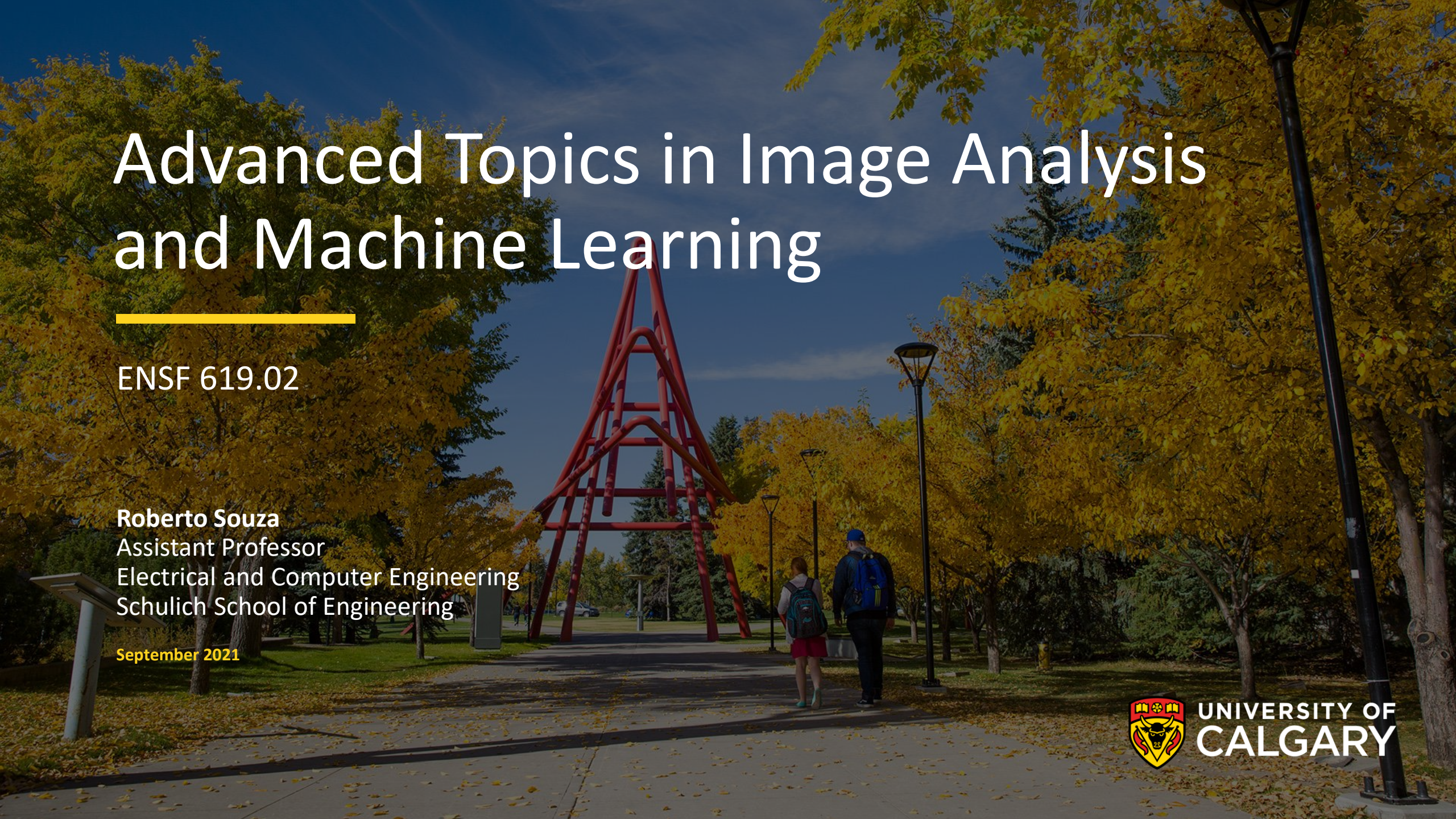


Advanced Topics in Image Analysis and Machine Learning

ENSF 619.02

Roberto Souza
Assistant Professor
Electrical and Computer Engineering
Schulich School of Engineering

September 2021

UNIVERSITY OF CALGARY

Disclaimer

If a student turns on their microphone or camera or uses the public chat feature, this constitutes consent for the student's video image or sound audio to be uploaded with the office hour or tutorial on university approved platforms such as D2L. If the student wishes to ensure that their questions/faces/voices are not recorded in the video, they should instead use private chat to ask questions.

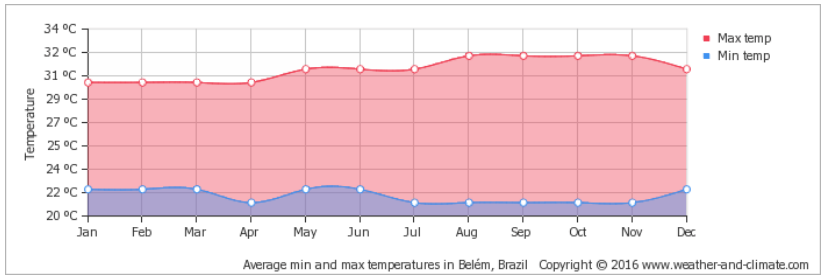
Disclaimer

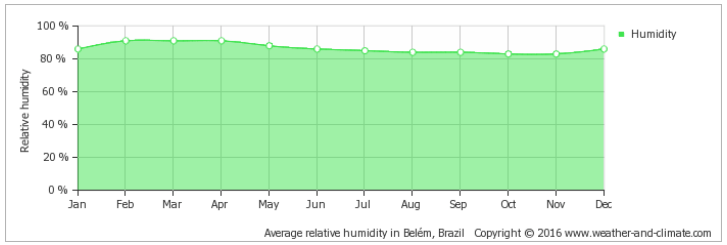
If unable to sit 6-feet apart, please wear your mask!

First Class Goals

- Get to know the class better and vice-versa
- Set expectations and prepare you for what will come
- Get started with graph-based image representation

Belém/Brazil





UNIVERSIDADE FEDERAL DO PARÁ

Electrical Engineering
B.Sc. - 2011

Grenoble INP

6-month exchange

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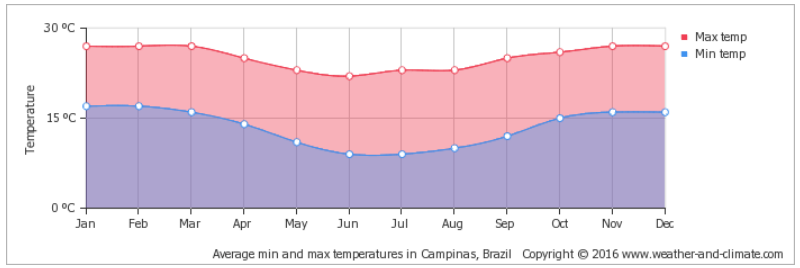
Campinas/Brazil



Penn
University of Pennsylvania

3-month exchange

UNICAMP

Computer Engineering
M.Sc. – 2014
Ph.D. – 2017

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6-month exchange

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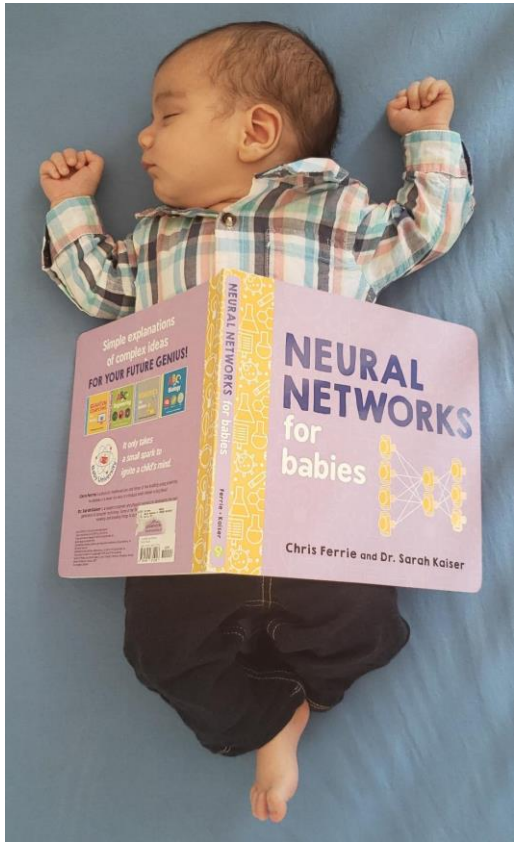
Calgary/Canada

UNIVERSITY OF CALGARY

Postdoctoral Fellow
June 2017 – June 2020
Assistant Professor
July 2020 - present



Baby Jorge – Born 12 September 2019

My wife (Mariana) also a researcher in AI

Wedding in Banff (-30C!) March 2019

AI runs in the family…

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Meet and Greet

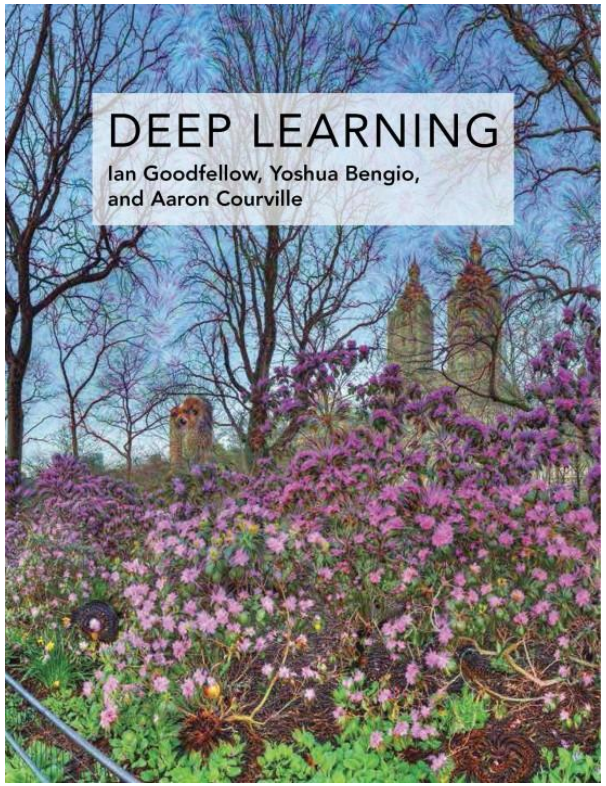
- Let’s get to know you. If you are comfortable, please share:
  - Name
  - Supervisor
  - Background

Course Delivery

- In person and through Zoom
- One 1-hour office hour during the week (Zoom – day and time TBD)
- Flexible
  - If you have any symptoms, please stay at home. You won't be penalized in any way;
  - If instructor has any symptoms, we will need to have classes through Zoom during that week :/

Textbook

- No mandatory textbook for this course



The Programming Environment (Part 1)

https://colab.research.google.com/

https://jupyter.org/

https://github.com/rmsouza01/ENEL645

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Research Computing Services

https://rcs.ucalgary.ca/index.php/RCS_Home_Page

The Programming Environment (Part 2)

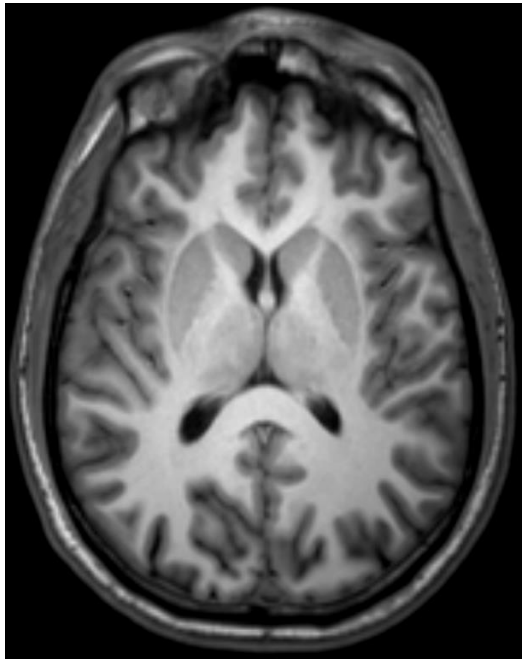
- Python 3
- Python libraries:
  - siamxt
  - NumPy
  - SciPy
  - Matplotlib
  - Scikit-learn
  - Scikit-image
  - Pandas
  - Tensorflow (version ≥ 2.0)

- Please have your programming environment in your computer or on Google Colab set up asap

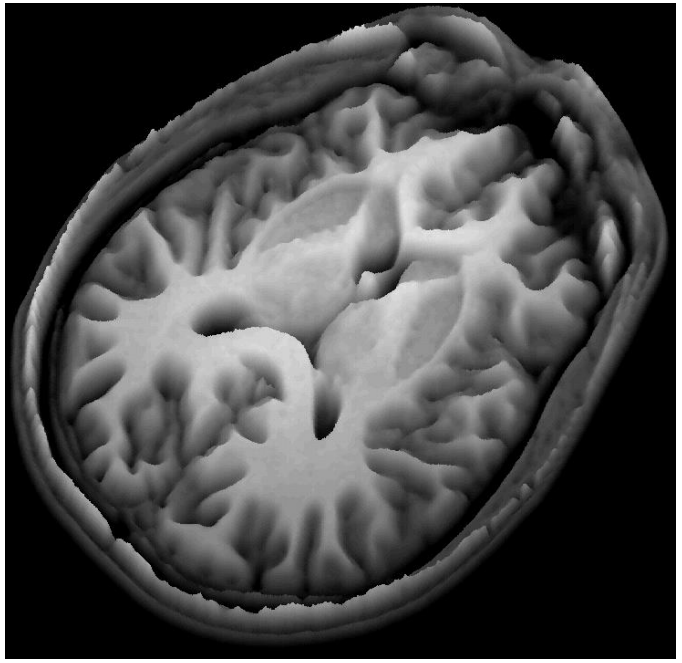
Deep Learning Framework

Connected Components

- “White islands in a binary image”

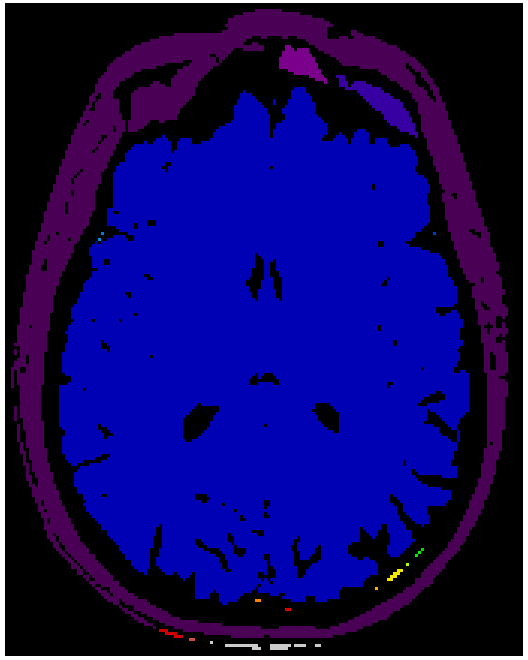


Axial brain image



Topographic view

Upper threshold f≥60



Labeled image

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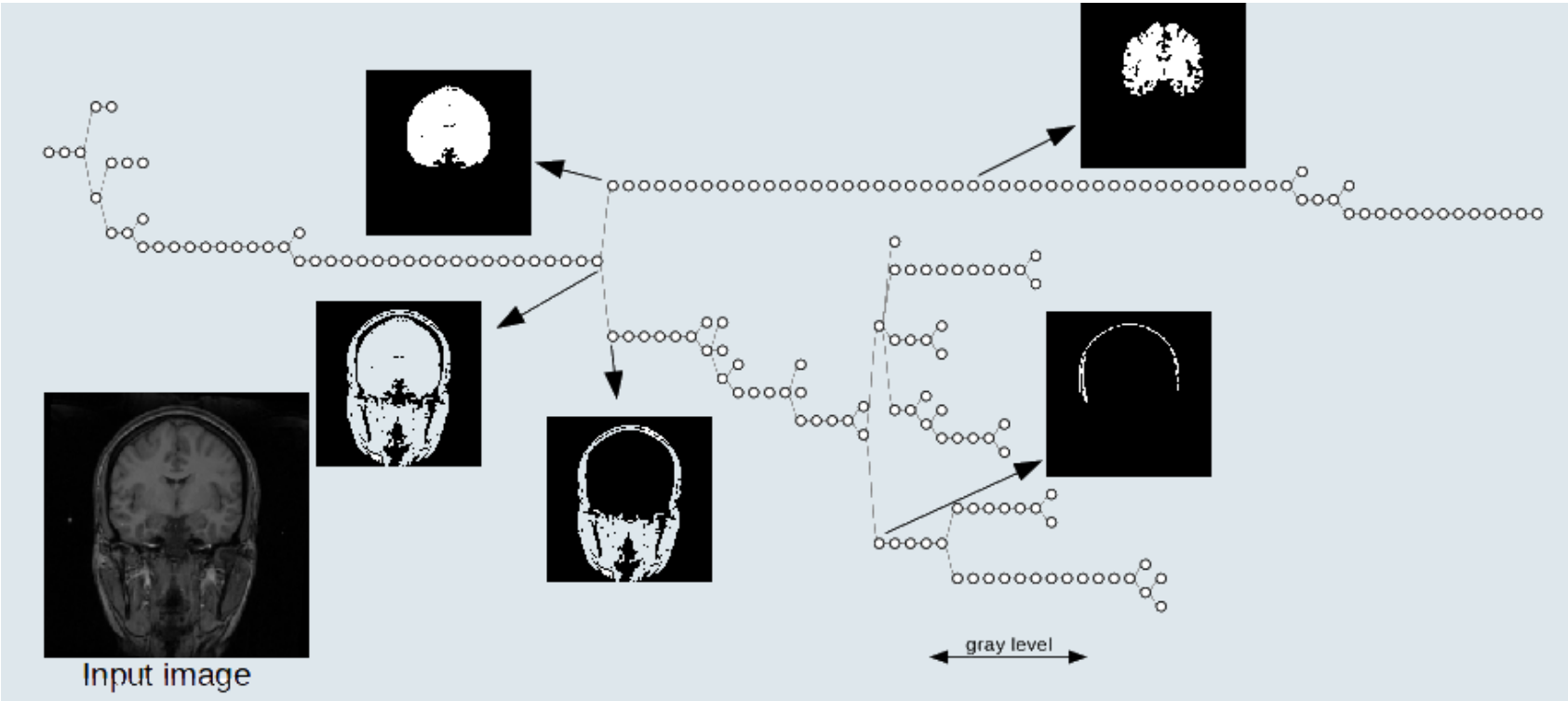
Max-tree

- Hierarchical representation of an image based on threshold decomposition



Max-tree illustration

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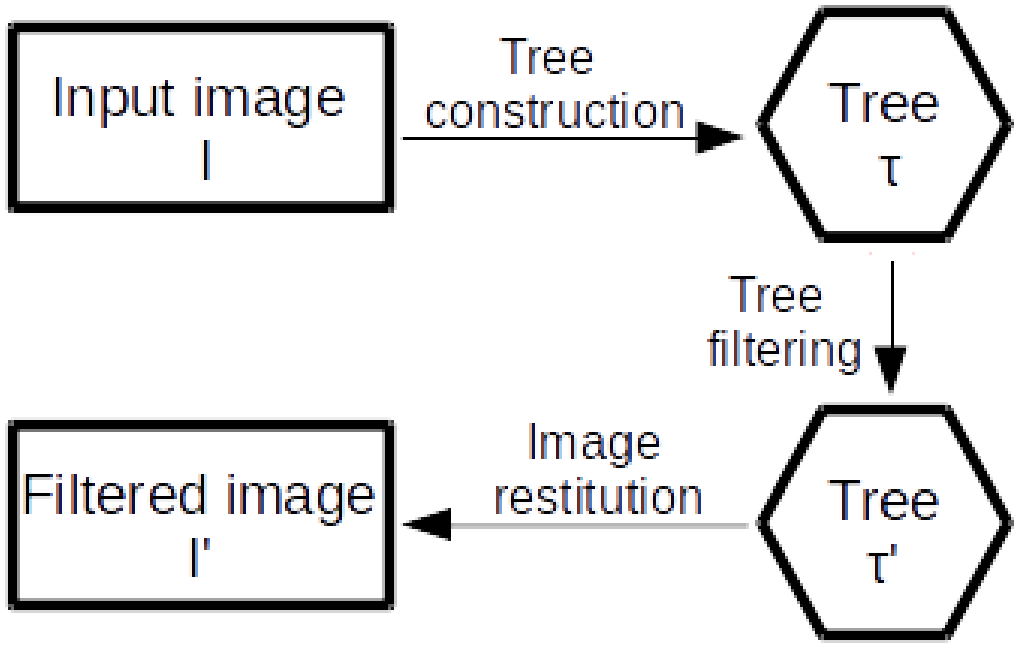
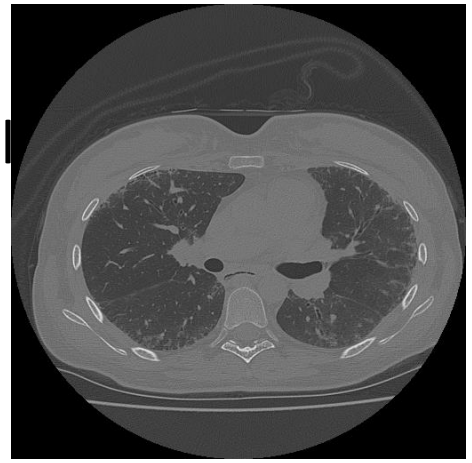
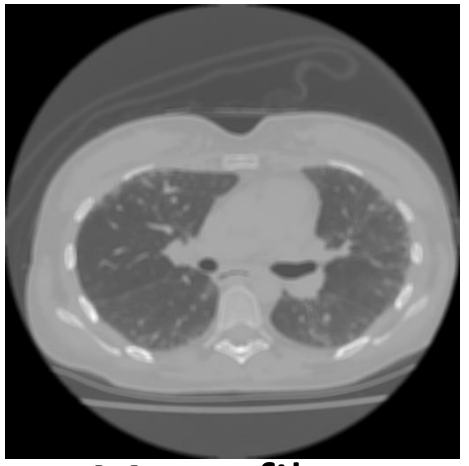
Max-tree

- Max-tree filters are connected filters, i.e. do not bl

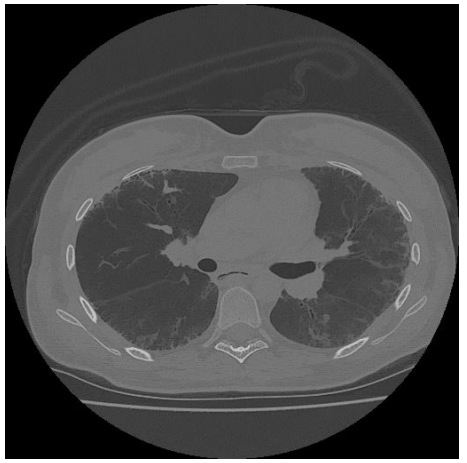




Original



Mean filter



Max-tree, area-open

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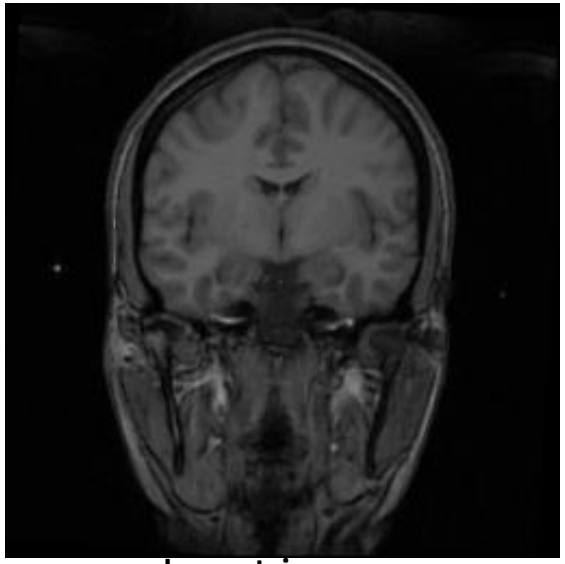
Segmentation with the Max-tree

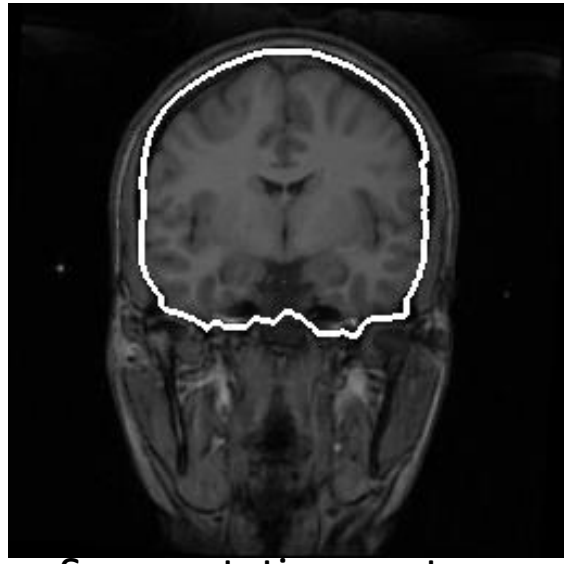
- Select max-tree nodes as markers based on a priori knowledge about size and shape of structures



Input image

Markers

Flooding-based segmentation



Segmentation contour

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Thank you!