

Prof. Dr. Tassadaq Hussain Cheema
Tehreem Sehar (Medical Imaging Expert)

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 Anna P. Medical Imaging Specialist \$20/hr 4.8/5 (14 jobs) Medical Imaging, Ultrasound Medical Research Assistant, Radiologist Sonographer, Ultrasound Technician See more	 Toulis M. Medical Imaging Specialist \$20/hr 4.9/5 (12 jobs) Medical Imaging, Ultrasound, Radiology USG, Ultrasound, Radiology MRI, X-ray, Soft Tissue, Radiology See more	 Aileen A. Medical Imaging Specialist \$20/hr 4.9/5 (14 jobs) Medical Imaging, Sonographer Medical Sonography Radiology Assistant See more	 Olga B. Medical Imaging Specialist \$20/hr 4.8/5 (12 jobs) Medical Imaging, Radiology Radiologist, Ultrasound Radiology, Radiology See more
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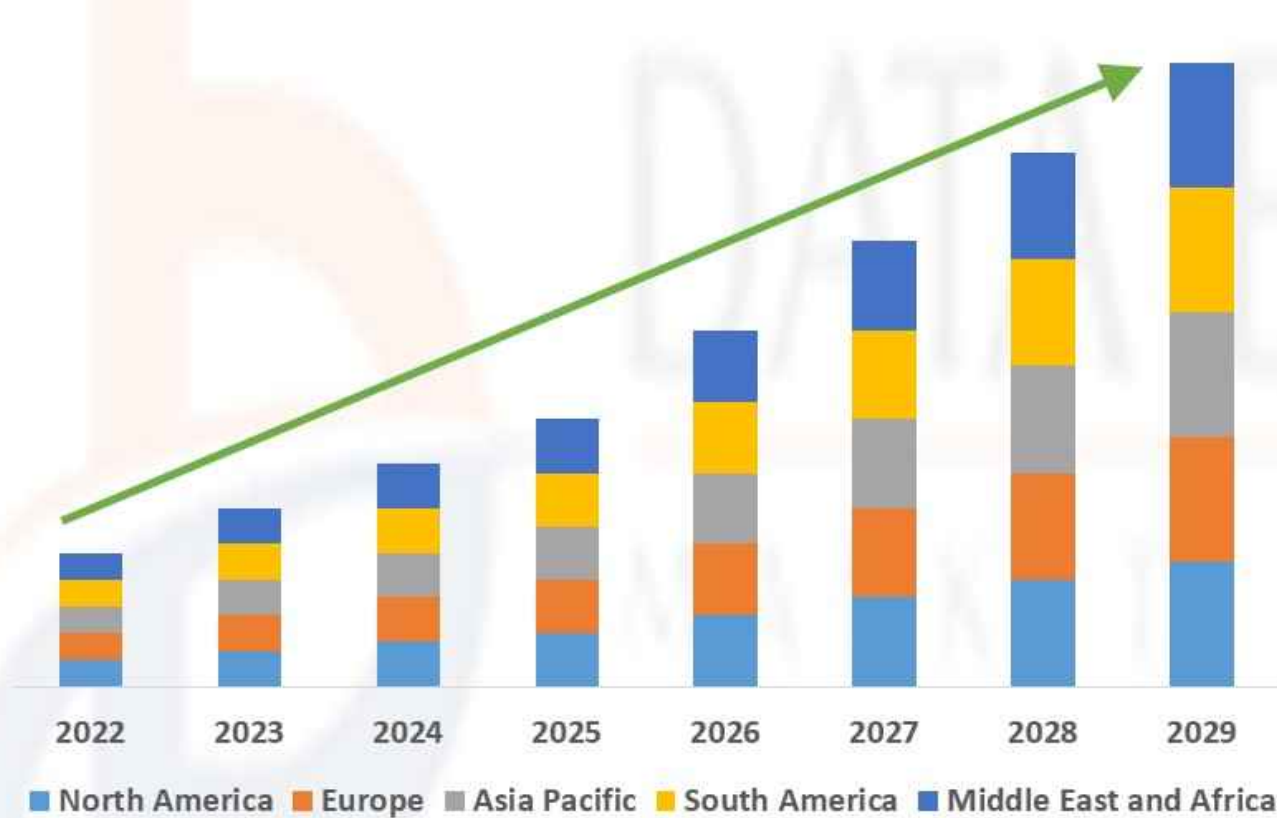
Definitions

- Medical imaging seeks to reveal internal structures hidden by the skin and bones, as well as to diagnose and treat disease.
 - Sensing Sources
 - Imaging Structure
- Radiologists, specialize in the analysis of medical images such as X-rays and MRI scans, as well as forms of interventional treatment.
- A cardiologist is a physician who specializes in the treatment of diseases relating to the heart and circulatory system.

Hype Cycle Of The Top 50 Emerging Digital Health Trends In 2021



Global Radiology Market is Expected to Account for
USD 43.04 Billion by 2029



DATA BRIDGE MARKET
RESEARCH

Need of Medical Imaging

- Health-care cost is increasing.
- With the improvement of digital electronics, numerous medical imaging features can be embedded into a single chip.
- Increase in multi dimensional medical data.
- Medical imaging applications require pixel level parallel processing.
- Imaging has become an essential tool in modern medical science.

Importance of Medical Imaging

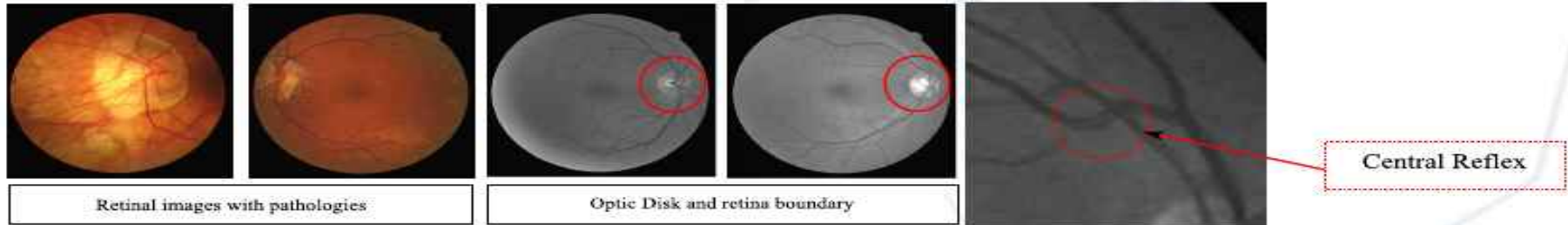
- A non-invasive methods of looking inside the body, to assist diagnose, treat and cure patients without causing any harmful side effects.
- Allow doctors to see inside a patient without having to cut them open.
- Helps to learn more about disease by understanding the disease patterns.

Medical Imaging System

- System Architecture
- Programming Toolkit
 - ✓ Medical Applications
 - ✓ Programming Languages

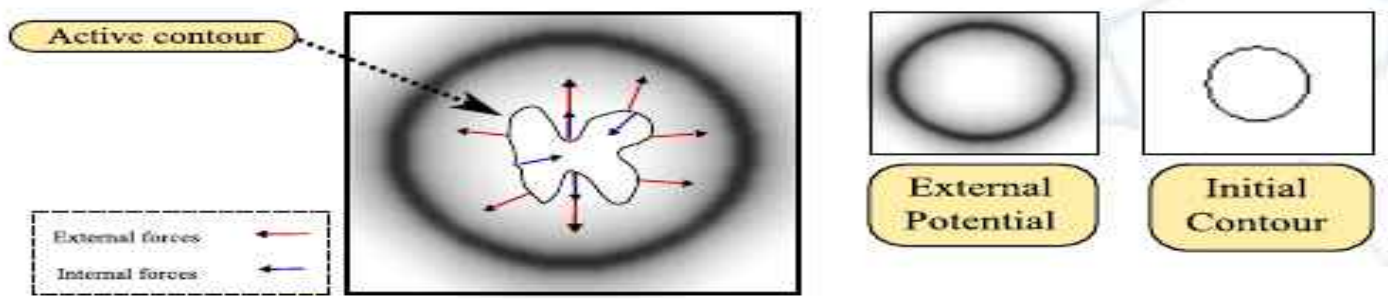
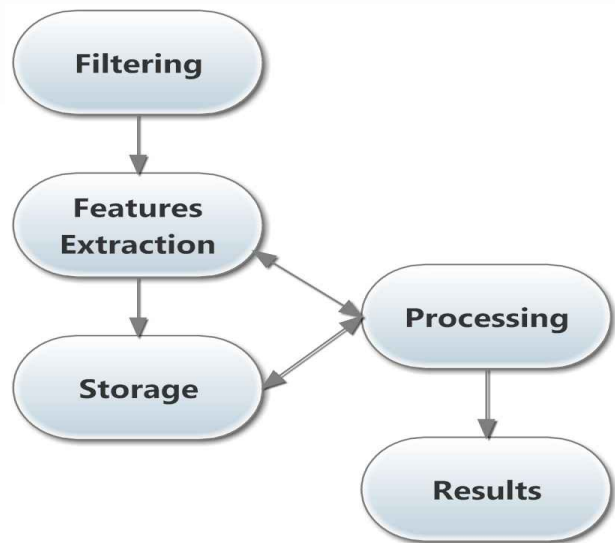
Challenges to MIP

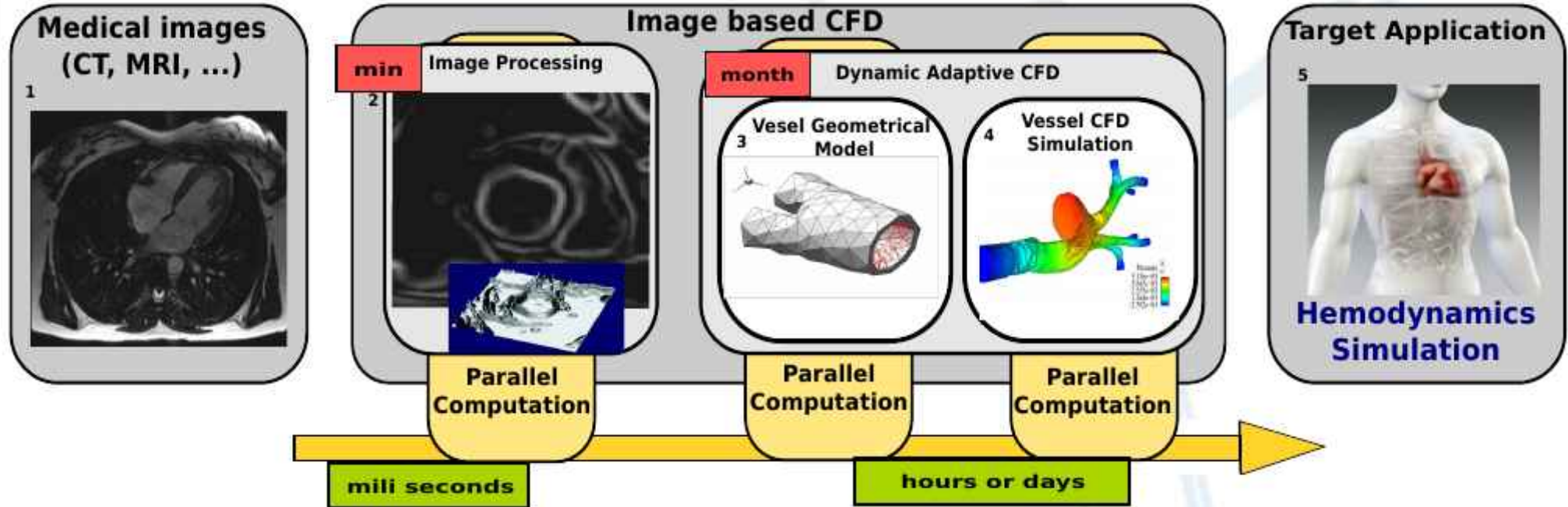
- Challenge: Hard real time requirements in medical imaging applications can be only tackled by pixel parallel processors.
- Solution: Design of an algorithm to extract the retinal vessel tree at a high computation speed taking advantage of SIMD processors.
- Pixel Level Snakes (PLS): resolve the high computational cost of classic active contour.
 - Massively parallel computation on every contour cell, implemented on SIMD architectures.
 - Strategy: Fitting the exterior of the vessels (only 12.7% of pixels belong to vessels).



DataTypes of Medical Images

- 1D = Rows or Column
- 2D = Rows x Column
- 3D = Rows x Column x Frames
- 4D = Spatial and Time (CT Scan)
- 5D = Dynamic cardiac CT scans





Medical Imaging Toolkits

ITK

Extensive suite of software tools for image analysis.

VTK

3D computer graphics, image processing and visualization. VTK consists of a C++ class library.

MITK

Used for development of interactive medical image processing software.

FSL

A comprehensive library of analysis tools for FMRI, MRI and DTI brain imaging data.

GIMIAS

A workflow-oriented environment for solving advanced biomedical image computing and individualized simulation problems, which is extensible through the development of problem-specific plug-ins.

Tasks

- **Get basic understanding of MIT**
 - Collect X-Ray, CT, MRI data from hospitals and label
- **Start Learning Python**
 - Google colab (<https://colab.research.google.com/>)
- **Install MITK libraries**
 - <https://github.com/MITK>
- **Start Playing with available data**
 - <https://towardsdatascience.com/medical-image-pre-processing-with-python-d07694852606>
- **Start Hunting**
 - Create account Fiver, upWork