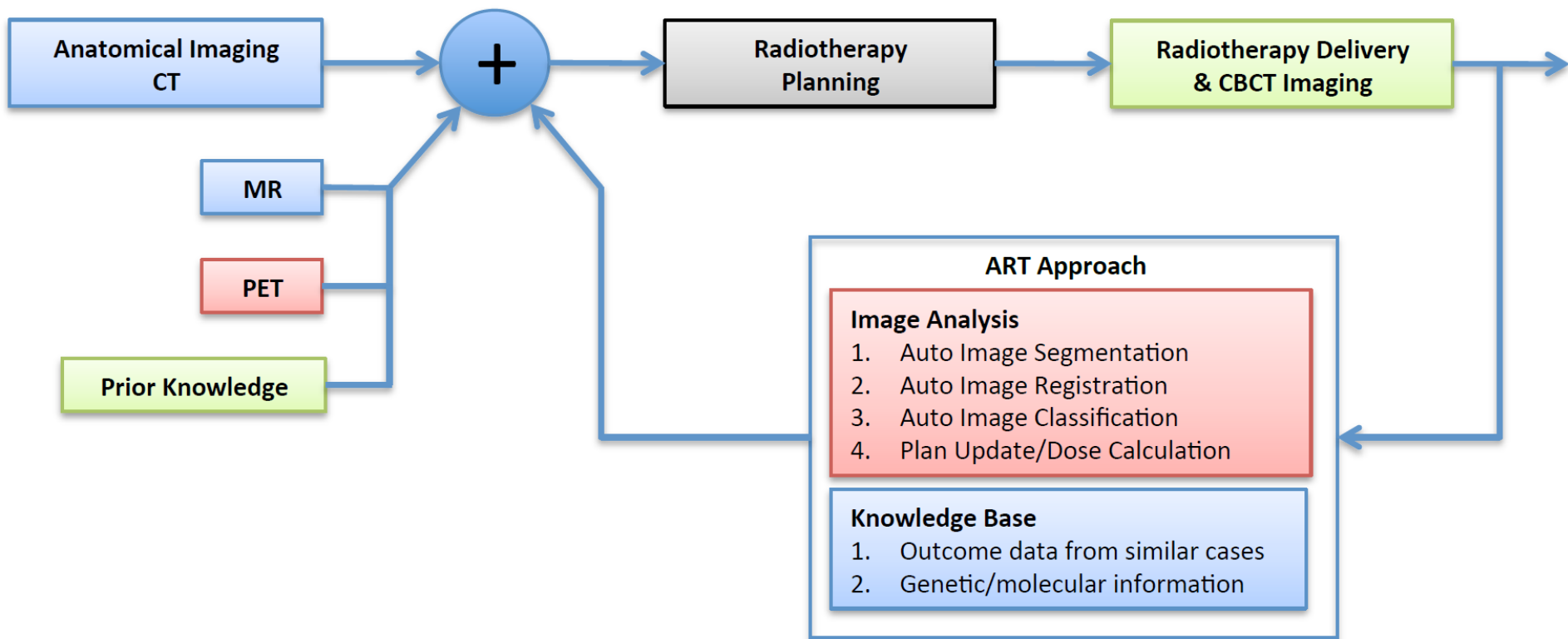


# Hardware Acceleration of Automated 4DCT Analysis: Implications for Adaptive Radiotherapy

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# Adaptive Radiotherapy

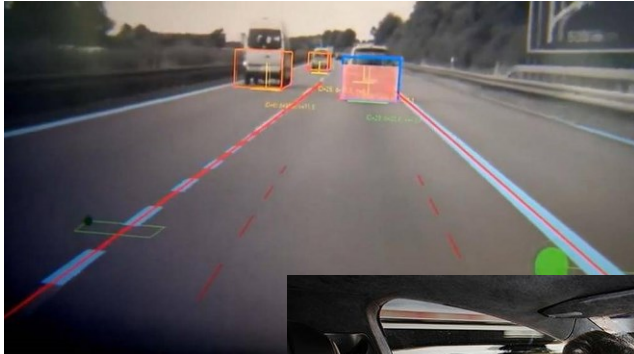


# Hardware Acceleration



- Using hardware better suited to an algorithm than general purpose processors
  - Greater parallelism
  - More efficient data usage
  - Deep processing pipelines
- Field Programmable Gate Array (FPGA)
  - Array of reconfigurable hardware
  - Hardware can be designed to suit the task

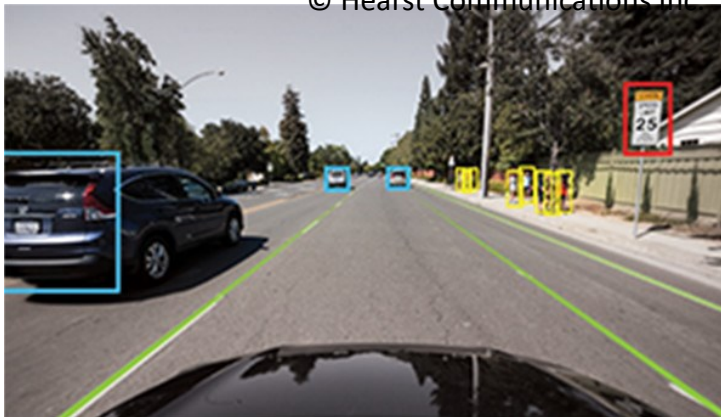
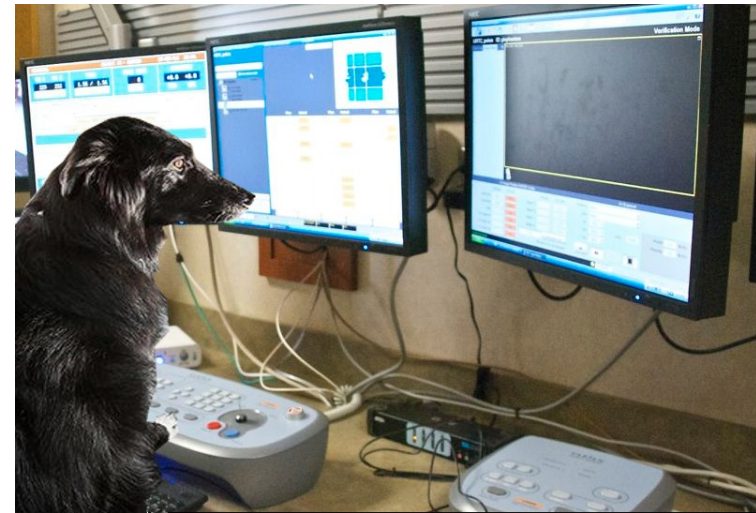
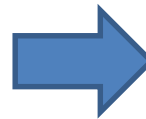
# Real-Time Processing



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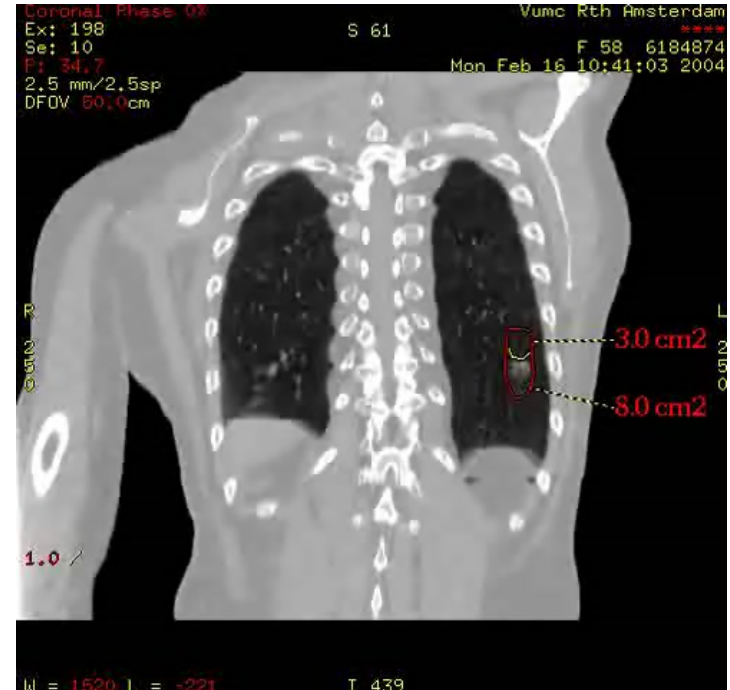
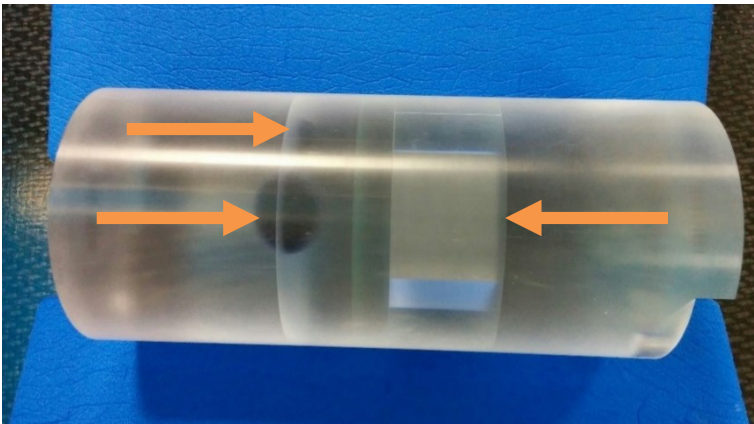


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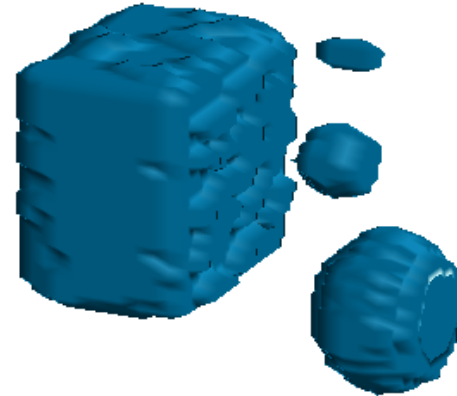
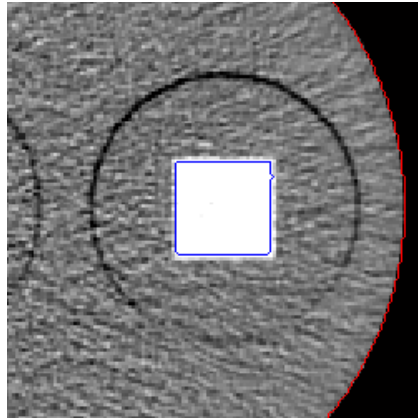
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# 4DCT Segmentation



- 3D mean filter
- Otsu's method to generate optimal thresholds

# Segmentation Results



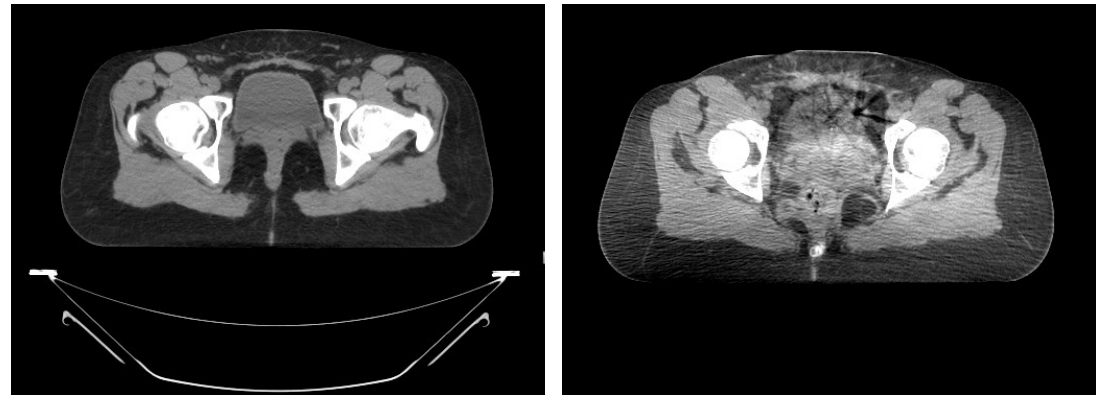
Case	Nominal Range of Motion (mm)	Detected Range of Motion (mm)
1	30	30
2	30	30
3	30	30
4	30	30
5	15	15
6	15	18
7	15	15
8	15	15

# Runtime Performance

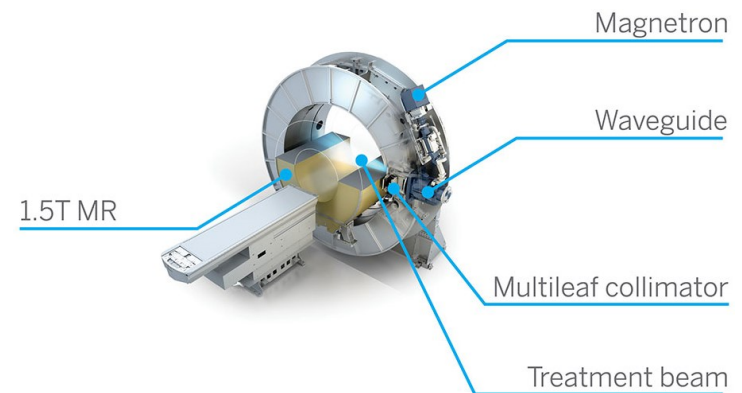
Implementation	Average Execution Time (ms)
ARM Cortex-A9	885.0
Hardware accelerated	14.8
Intel Core i5	17.0

# Future Work

- Hardware acceleration of planning CT and daily CBCT registration



- Automated plan adaptation
- Accelerating dose calculation





# Acknowledgements



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