

Motivation



Commo

Femoral

Arterv

Femoral

Nerve

Common Lymphatic

Vessel

Femoral

- Mass casualties in multidomain operations will require prolonged field care
- Automated life-saving interventions are needed to manage non-compressible hemorrhage on the battlefield
- Al-guided ultrasound will enable medics to efficiently access the proper central vein or artery for catheter placement

- and vein*
- (e.g. image rotation and
- annotations



- Locate artery and vein during probe movement
- Track artery and vein based on location/appearance
- Cue medic to position system for best insertion point
 - Insert needle through guide
 - Continue tracking vessel and needle during insertion

Al automates image interpretation and guidance, increasing efficiency for non-specialists

Vascular Access RAAINS 11/13-15/1

Portable ultrasound

with needle guide

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Femoral Triangle

MGH Collaborators: Theodore Pierce Anthony Samir

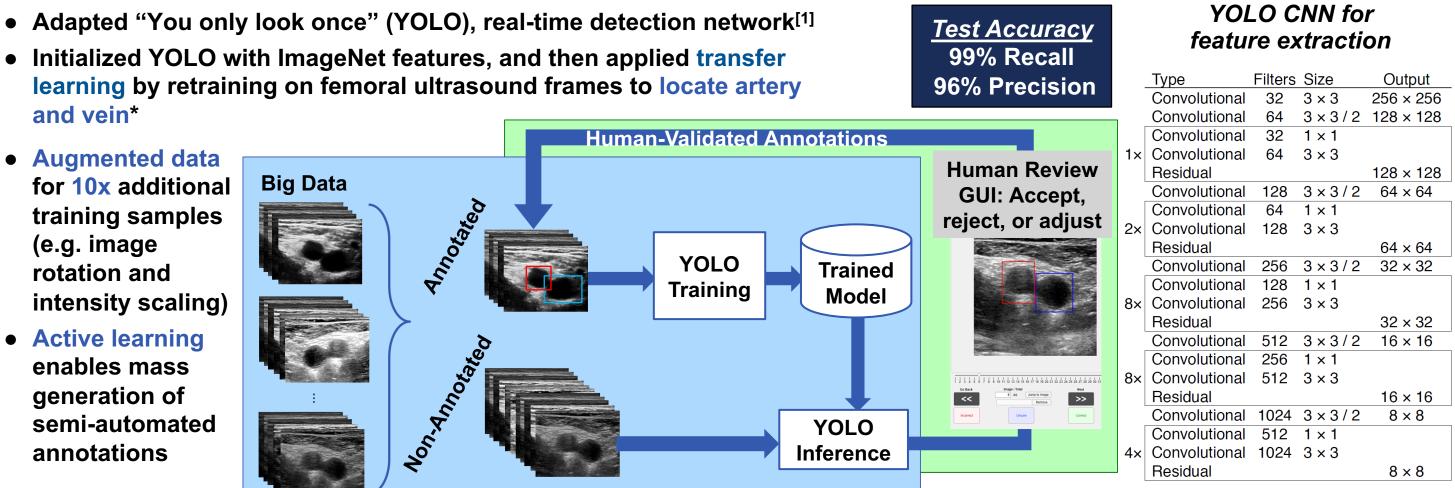
*Approved by the IRB from Massachusetts General Hospital. All data are de-identified.

¹¹Yolo: J. Redmon, et al. "You only look once: Unified, real-time object detection." IEEE CVPR, 2016.

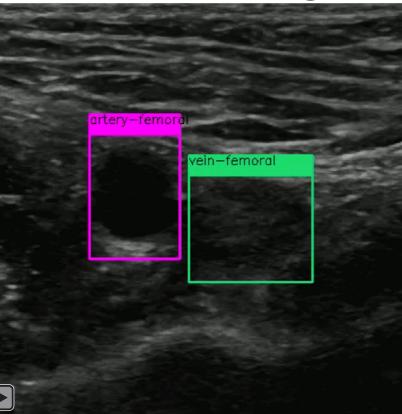
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Active Deep Learning-Based Approach



Example Detection on Human Images



05-Nov-2019 Depth: 4 CM Gain Needle Depth: Targe **IJVPhantom** Depth Indicator:

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Combat Casualty Care Research Program

