Back pain is a prevalent health issue in the developed world, with up to 80% of adults experiencing it {sometime} [Rubin2007]. It is a leading cause for missed work and doctor visits.

When conventional oral medication proves ineffective, the next step is often a diagnostic injection of anesthetic into the facet joint of the painful area. The small diameter of the facet joint as a target for injection, coupled with its proximity to sensitive nerves of the spine, necessitate the use of visualization of interventional navigation. Fluoroscopy or CT are currently the standards of care for facet joint injection because they provide detailed visualizations of the patient’s anatomy and needle placement. Fluoroscopy and CT require the use of ionizing radiation, and so must be performed at the specialized radiological facilities for health and safety standards. Despite these standards, fluoroscopy and CT still expose patients and practitioners to harmful ionizing radiation. The financial cost of these imaging methods and their proper operation, the radiation exposure resulting from their use, and the volume of injection procedures which they are used for, combine to impose a substantial cost of the health care system. This cost, however, may be largely unnecessary if a radiation-free imaging modality were used.

Ultrasound-based navigation for spinal interventions has received attention in research as such a radiation-free imaging modality. The simplest method for ultrasound guidance involves holding the probe so that the image plane contains the path of the needle [Hurdle2016]. This method has not gained widespread use due to the difficulty of interpreting ultrasound images and manipulating the probe and need simultaneously. More sophisticated methods involve the registration of prior CT or MRI scans to intraoperative, spatially tracked ultrasound. Inter-modality image registration-based visualization produces models suitable for assessment and injection guidance, however many patients will not have had prior CTs and performing CTs for this purpose reintroduces the problem of harmful radiation. MRI is not an ideal solution either due to its limited availability and high cost.