SINGULAR HEALTH AND CSIRO SUCCESSFULLY DELIVER AI-DRIVEN SPINAL SEGMENTATION PROJECT

- Singular and CSIRO collaboration completes successful automated segmentation of spinal vertebrae from CT scans with >95% accuracy.
- Target market spinal surgeries currently require pre-operative planning with manual segmentation consuming valuable time by surgeons and radiologists.
- Artificial Intelligence (AI) model deployed within Singular's MedVR & 3DicomViewer can automatically segment a spine in just 2 minutes.
- Segmented spine is editable by radiologists and surgeons to ensure 100% accuracy.
- Robust artificial intelligence model trained using hundreds of labelled CT scans.

25 March 2021 – Singular Health Group Ltd (**ASX: SHG**) ("**Singular Health**", or "**the Company**") is pleased to announce that a collaborative research project conducted with CSIRO, Australia's national science agency, has successfully concluded with the development of an artificial intelligence model capable of automatically segmenting spinal vertebrae from CT scans.

The automated instance segmentation and labelling of spinal vertebrae allows surgeons and radiologists to not only visualise the spine in 3D using the Company's MedVR & 3DicomViewer software but to manipulate individual vertebrae, better plan their surgeries and even design custom surgical implants and guides.
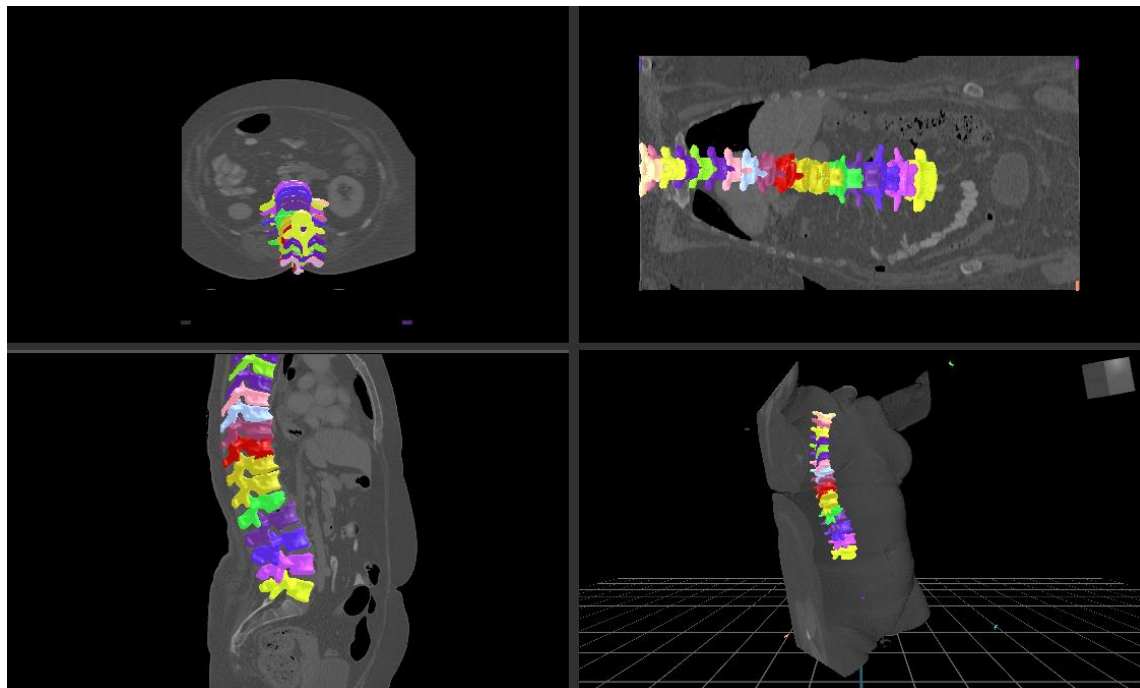

Figure 1 Semi-Automated Segmented Vertebrae registered to patient in MedVR

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Taking just over 2 minutes to perform the analysis and segmentation, the AI model eliminates hours of tedious manual segmentation by medical practitioners and is being labelled as a semi-automated segmentation process as it will allow surgeons and radiologists to edit the output and ensure 100% compliance with their interpretation of the image whilst still saving vast amounts of processing time.

The project is made possible through CSIRO Kick–Start, an initiative that provides funding and support for innovative Australian start-ups and small businesses to access CSIRO's research and development (R&D) expertise and capabilities.
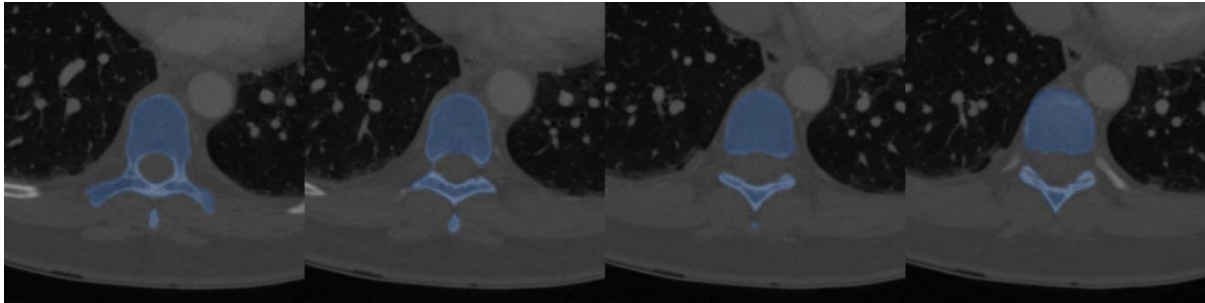

Figure 2 Manual Segmentation Process

Manual segmentation involves the identification and marking of the vertebrae on every single CT slice, of which there can be hundreds, and despite existing aids this process is slow and mentally fatiguing as it must be exact (Figure 2).

The collaborative research project sought not only to automate this process but to also generate 3-dimensional surface models (STL files) which could be saved separately and transposed onto the source DICOM file as separate objects which can be visualised and manipulated in Singular Health's Volumetric Rendering Platform.

Using a dataset of more than 200 CT scans of labelled data, the CSIRO team trialled a number of different AI models and pre-and-post processing techniques to achieve the instance segmentation, labelling, surface meshing and spatial location of the individual vertebrae.

Singular Health assisted in the procurement of the dataset and through development of the registration process/mechanism by which the STL files are exactly matched back to their original scan.

Figure 3 Grouped 3D Vertebrae

Dr Guan Tay, Executive Director of Innovation at Singular Health said:

"Singular Health has had the unique opportunity to access the deep-domain knowledge of CSIRO's data scientists to develop this semi-automated instance segmentation and labelling of the spinal vertebrae. We are conducting further testing and validation of the spine segmentation function before commercial release.

"The use of artificial intelligence in medical imaging, and more specifically radiology, has the ability to profoundly change the workflow for radiologists.

"With around 45,000 Australian's undergoing spinal surgery every year, the rapid segmentation will save thousands of hours for radiologists and surgeons who will only have to make small mark-ups and/or validate the segmentation as opposed to manual segmentation slice-by-slice.

"We would like to thank the team at CSIRO and the efforts of our internal developers for their dedication to the collaborative research project and for delivering a successful outcome."

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This announcement has been authorised for release by the Singular Health Board of Directors

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About Singular Health:

Founded in 2017, Singular Health is a medical technology company that has developed and commercialised the proprietary Volumetric Rendering Platform ("VRP") for the 3D & VR visualisation of anatomy using standard radiological imagery.

Singular Health is developing technologies that provide patients and practitioners with access to personalised, enhanced medical data to inform better health decisions and is currently developing and deploying software products that are built upon the proprietary VRP on a global scale through a direct-to-consumer Software-as-a-Service ("SaaS") model.