

## Artificial Intelligence: The Role in Supporting Person-Centred Care.

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### Introduction

There remain inequities of opportunity and access driven by intrinsic and extrinsic factors throughout a patient's healthcare experiences, including in radiology and nuclear medicine. Artificial intelligence (AI) has the potential to either widen the health inequity divide or substantially reduce it. While there are a number of challenges to overcome in the AI pipeline, the potential to enhance person-centred care by connecting resources and expertise through an AI platform needs to be considered.

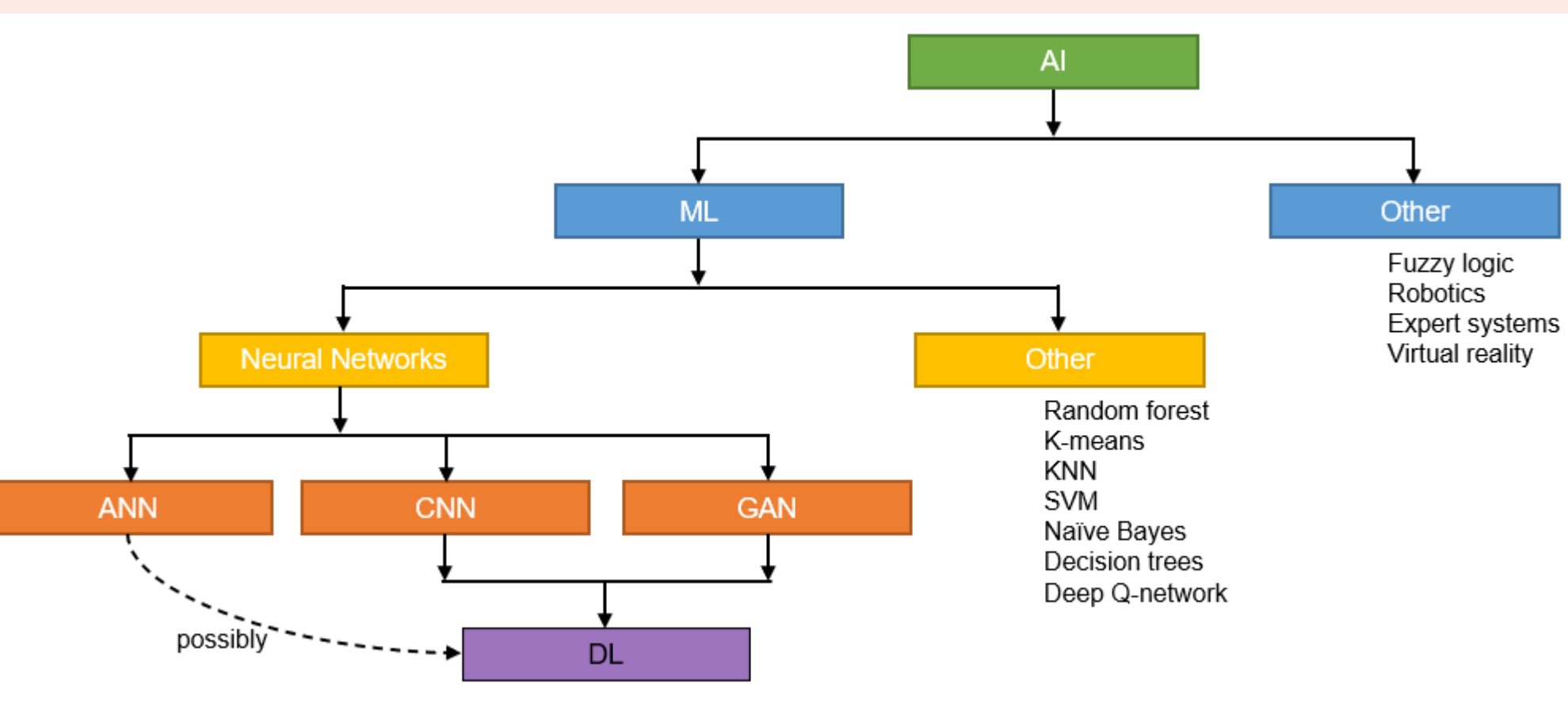


Figure 1: Flow chart delineating types of AI and ML.

### Machine Learning

Not all ML (fig 1) applications apply directly to person-centred health care.

- ML applications (fig 2) in business analytics could be used to optimise scheduling and staffing in a manner that benefits patients; person-centred.
- ML can also identify from among a large number of patient specific variables, the individual or aggregate weighted and scaled combination (algorithm) of variables most predictive of the outcome of interest; person-centred care.
- ML is also a powerful tool for data mining of big data; person-centred care.

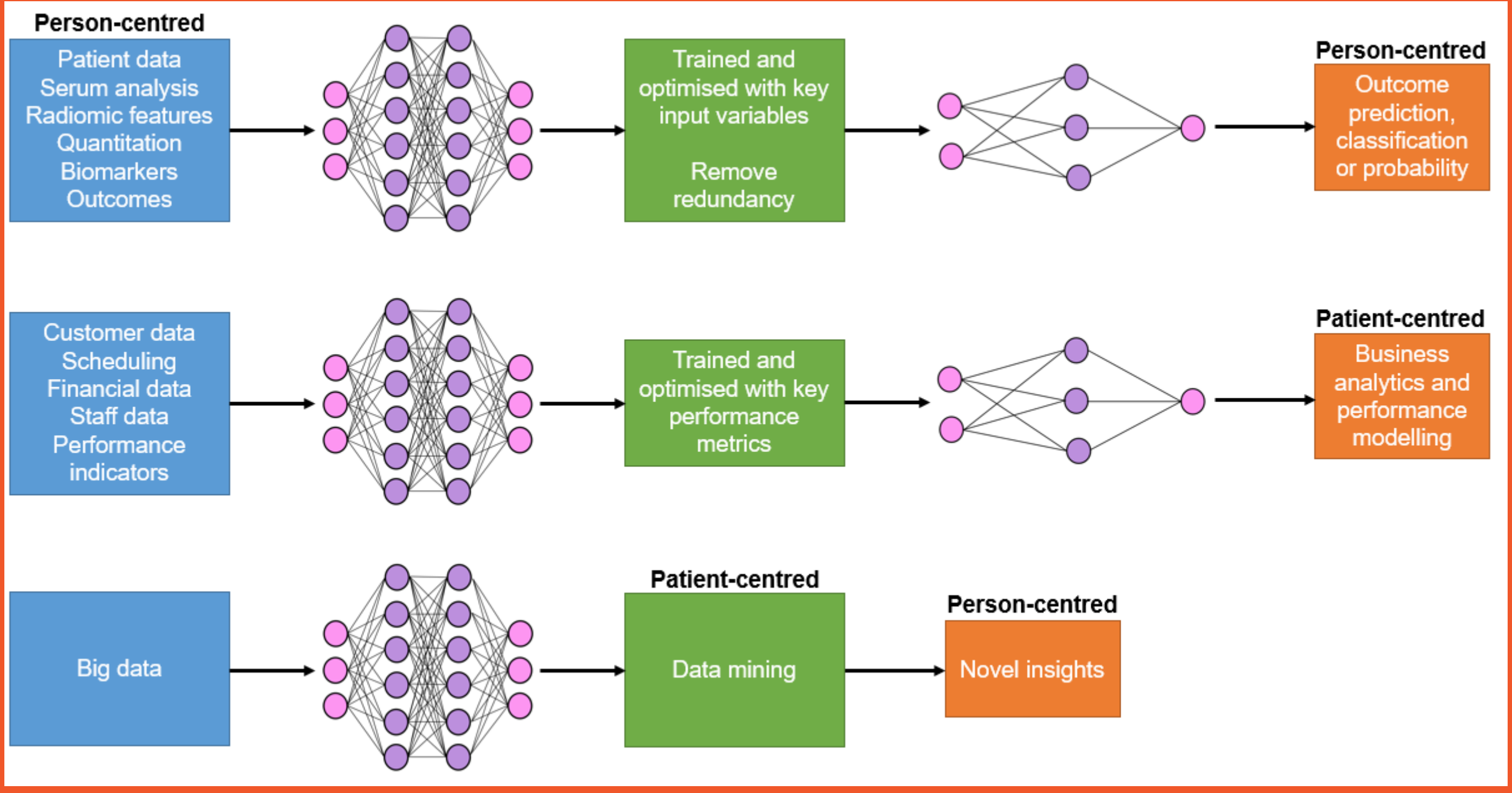


Figure 2 (above): Schematic representation of several roles of ML in radiology and nuclear medicine that provide patient-centred or person-centred care.

Figure 3 (below): The traditional semantic reporting incorporating radiomic features in a system-centred approach.

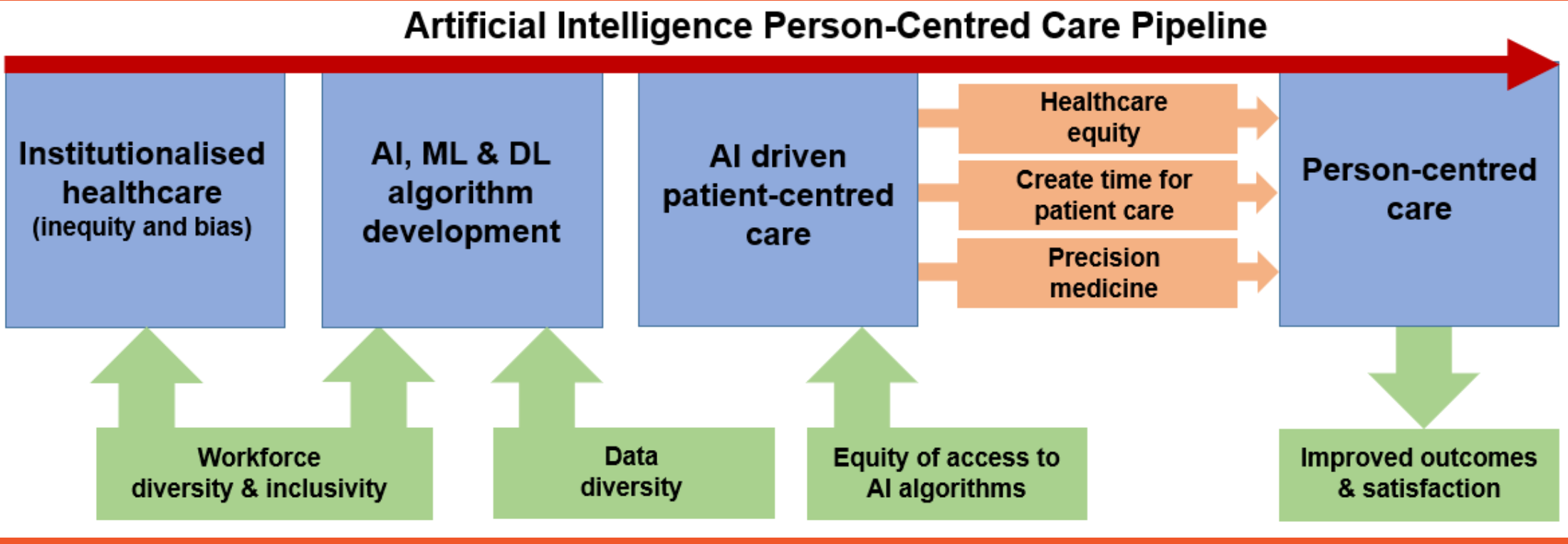
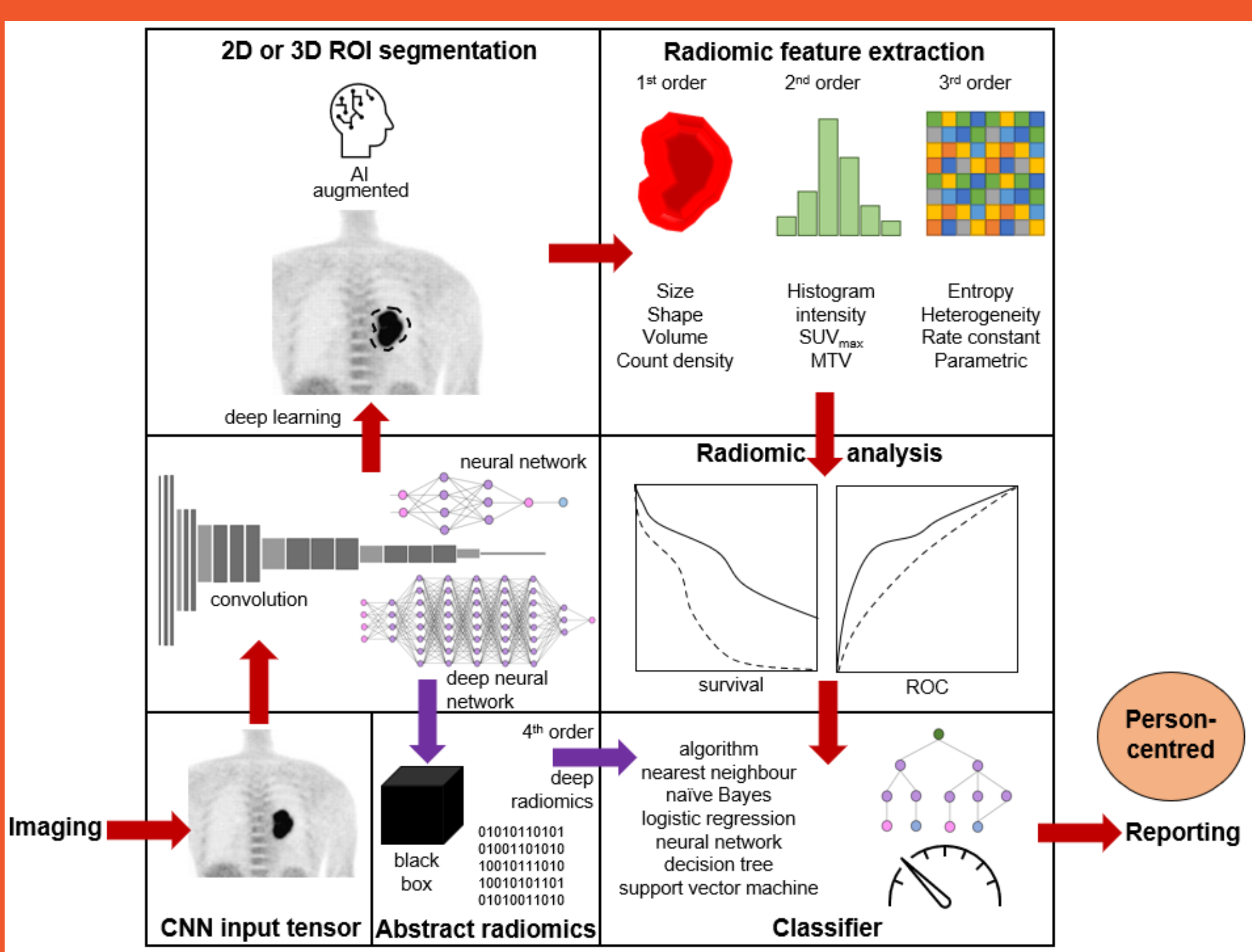
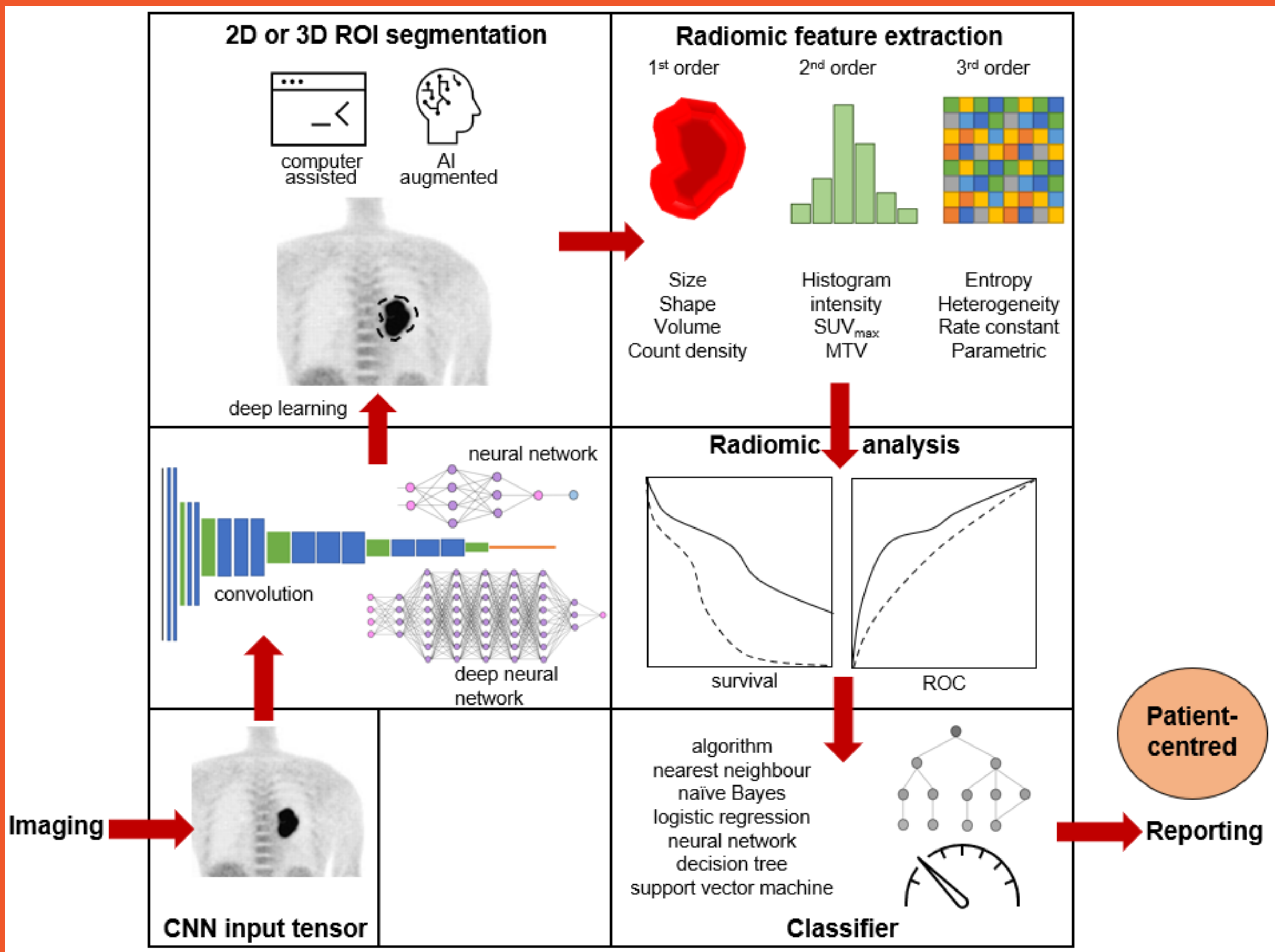
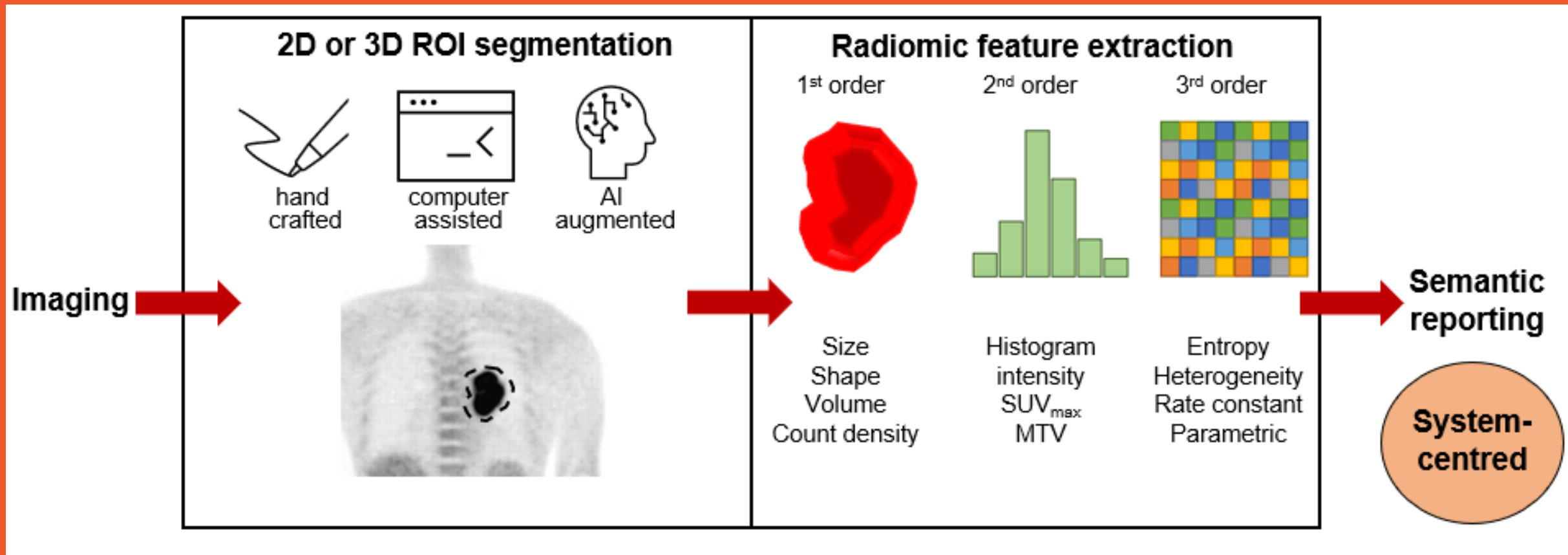


Figure 6: The AI driven person-centred care pipeline.

### Key Points

- Person-centred care is dependent on equity in access and opportunity for services.
- Social asymmetry threatens otherwise well-crafted person-centred strategies.
- AI offers a potentially valuable tool in addressing healthcare inequities, including radiology and nuclear medicine services.
- AI algorithms need to address potential bias and inequity.
- Lack of diversity in the teams or data needs to be resolved to enable creative problem solving and extend the advantage of AI to person-centred care (fig 7).

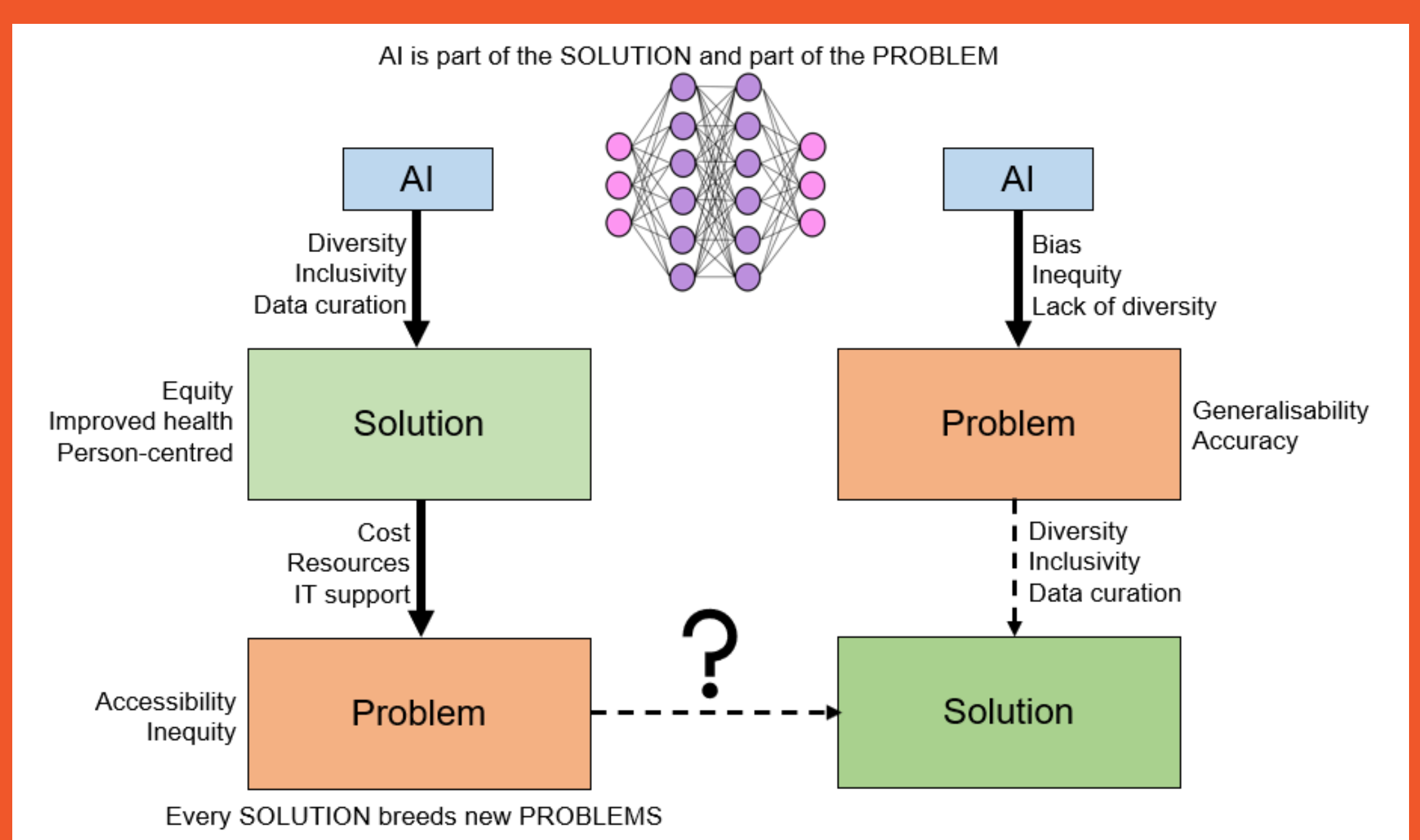
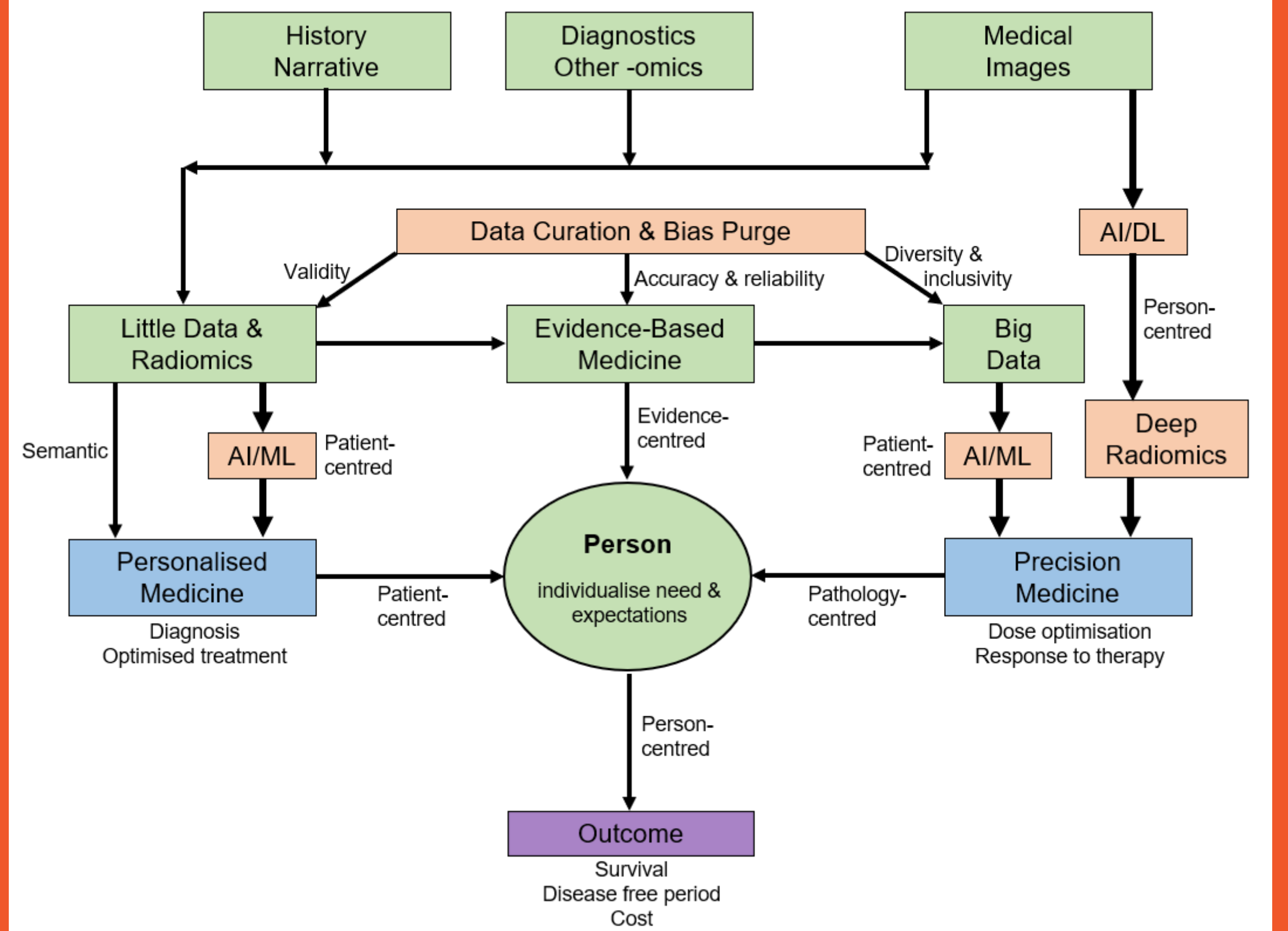


Figure 4 (left): Computer-aided or AI augmented segmentation and radiomic feature extraction (first, second and third order) for reporting drives a patient-centred approach.

Figure 7 (above): AI is part of the solution for inequity and providing person-centred care but can also be part of the problem associated with bias, inequity and social asymmetry.

Figure 5 (below left): AI augmented segmentation with first, second and third order radiomic feature extraction integrated with fourth order deep radiomics from the input tensor use DL informed reporting for person-centred care.

Figure 8 (below) Flow chart outlining the connectivity between AI, diversity in data, radiomics and person-centred care.



### Deep Learning

The most widely reported applications of AI in radiology and nuclear medicine are associated with DL and CNNs. These applications could be simplified into several novel approaches that drive person-centred care (figs 3, 4 and 5):

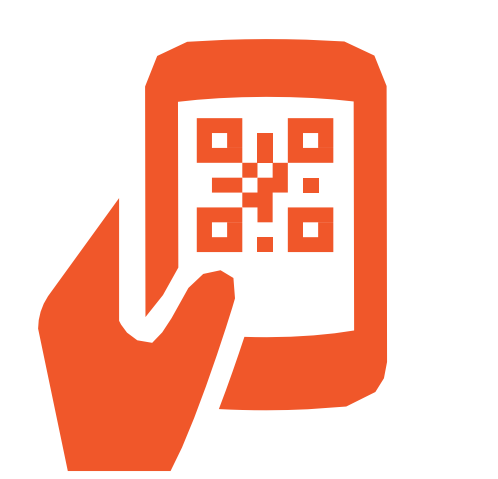
- DL and CNN for object detection and segmentation for auto-segmentation to allow radiomic feature extraction, improving accuracy and efficiency, improving patient outcomes and creating more time for patient care; patient-centred care.
- DL and CNN extraction of abstract features not intuitive to the human observer directly from image tensors allows identification of patient management needs; person-centred care.
- CNN based algorithms designed for triaging urgent cases for priority reporting; patient-centred care.
- CNN approaches to attenuation correction, image co-registration, optimisation of patient positioning, optimisation of acquisition parameters, enhancement of image quality and noise reduction, radiation dose reduction, and detection of radiomic feature change over serial images are all consistent with a patient-centred approach to care.
- CNNs and DL augmented radiation dosimetry for radionuclide therapy provides patient-centred and person-centred molecular theranostics.

### Discussion

- AI in nuclear medicine and radiology could eventually emerge as a powerful tool in social and health equity but is already producing improvements in workflow and person-centred care (fig 6).
- AI has the potential to reinforce institutional and historical biases but careful curation of data may allow AI to be used to not only identify bias, but also to eliminate it; enhancing patient-centred care and precision medicine.
- AI, especially through DL approaches, affords the chance to interrogate individual patient images through an abstract deep learning lens that could identify unique radiomic features of the individual patient not otherwise detectable.
- In doing so, AI augmented image interpretation can accommodate unique features of individual patients and enhance both person-centred care and precision medicine.

### References:

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- Currie G, Rohren E. Social asymmetry and artificial intelligence: the nuclear medicine landscape, *Seminars in Nuclear Medicine*, 2022; 52:498-503.
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