Deep learning - how can we apply it in IMPC?

ML hackathon 23/01/2019

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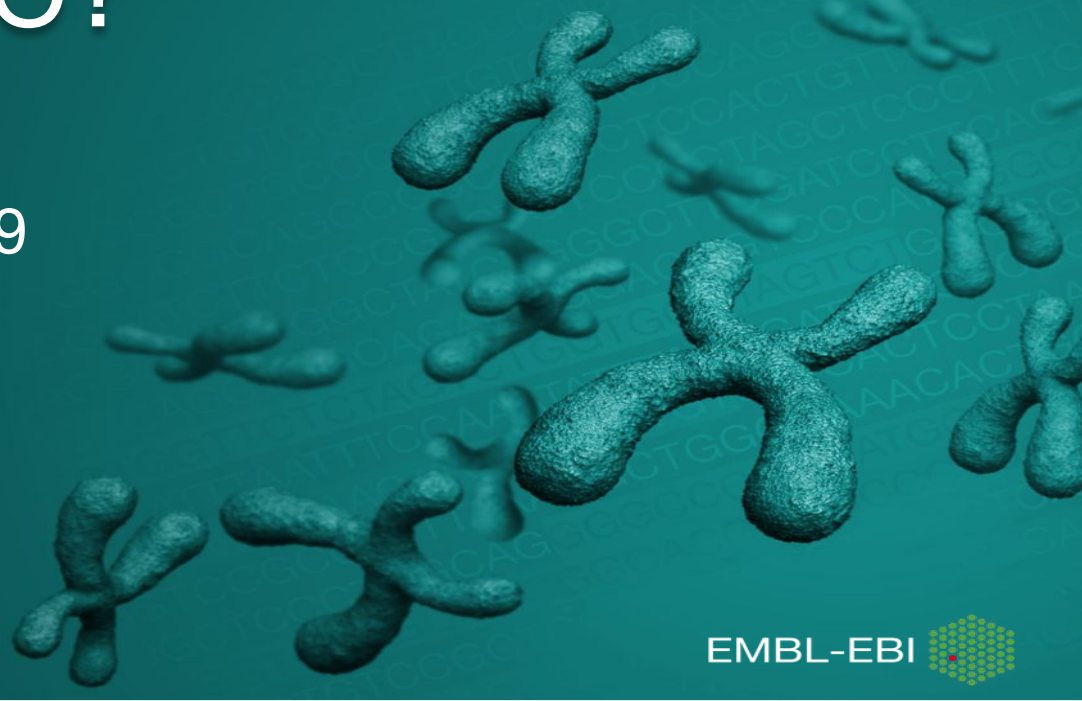
Mouse Informatics



EMBL-EBI

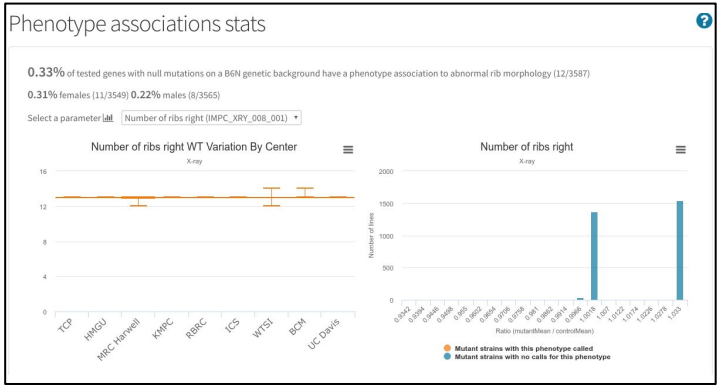
From procedure to phenotype

Number of ribs right [IMPC_XRY_008_001]	1.1	simpleParameter			✔						INT
Number of ribs left [IMPC_XRY_009_001]	1.1	simpleParameter			✔						INT
Shape of ribs [IMPC_XRY_010_001]	1.0	simpleParameter	✔		✔		normal abnormal imageOnly unobservable				TEXT
Fusion of ribs [IMPC_XRY_011_001]	1.0	simpleParameter	✔		✔		not fused fused imageOnly unobservable				TEXT
Pelvis [IMPC_XRY_012_001]	1.0	simpleParameter	✔		✔		normal abnormal imageOnly unobservable				TEXT
Number of cervical vertebrae [IMPC_XRY_013_001]	1.1	simpleParameter			✔						INT
Number of thoracic vertebrae [IMPC_XRY_014_001]	1.1	simpleParameter			✔						INT
Number of lumbar vertebrae [IMPC_XRY_015_001]	1.1	simpleParameter			✔						INT
Number of pelvic vertebrae [IMPC_XRY_016_001]	1.1	simpleParameter			✔						INT
Number of caudal vertebrae [IMPC_XRY_017_001]	1.1	simpleParameter			✔						INT

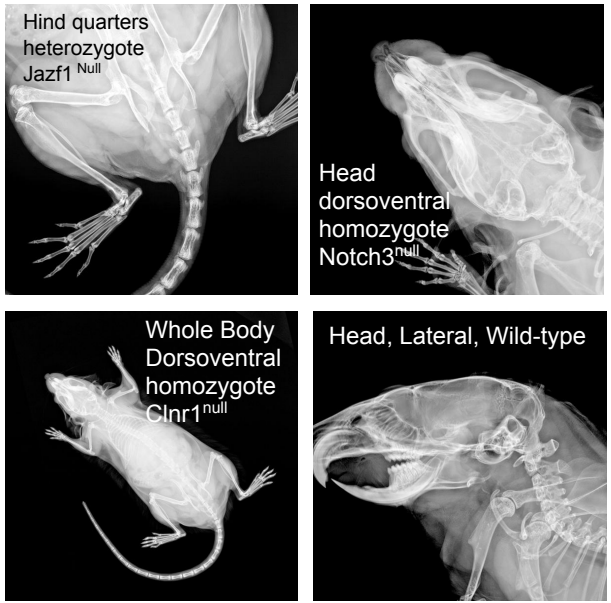
Potential Ontology Annotations for Parameter: Number of ribs right

[IMPC_XRY_008_001]

	Option	Increment	Ontology Term	Ontology ID	Sex
INCREASED			increased rib number	MP:0000480	
DECREASED			decreased rib number	MP:0003345	
ABNORMAL			abnormal rib morphology	MP:0000150	



Example Data Sets – IMPC X-rays



- Skeletal malformities assessed by X-ray analysis
- Many quantitative and qualitative values needed per mouse
- Manual curation of images is error prone and a bottleneck in dataflow
- Interest in using machine learning to automate annotation

Objective

Apply deep learning, specifically CNNs to

- Image segmentation
- Image quality control
- Morphometric measurements

For this workshop:

- Transfer learning on mouse x-ray images
- Ideas of other problems we can apply deep learning techniques to