Case study with Charles River Laboratories

Quantitative toxicology evaluation with deep learning AI

aiforia®
AI for image analysis

charles river

TOXICOLOGIC PATHOLOGY AT CRL

Almost 4,000,000 microscopic slides evaluated at CRL in 2019 in support of the medical and chemical industries

CRL supported the development of approximately 85% of drugs approved by the FDA in 2018

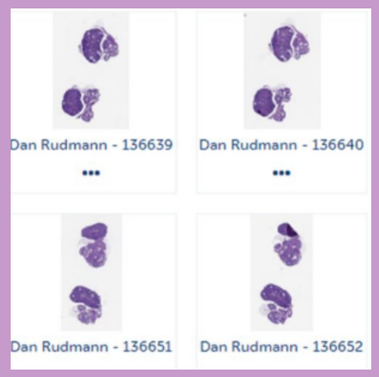
OBJECTIVES AND BACKGROUND

- Ovarian follicle counts are done in reproductive toxicity assessments
- Counts are time consuming and difficult
- Aim is to accelerate and standardize image analysis with Aiforia's AI solution

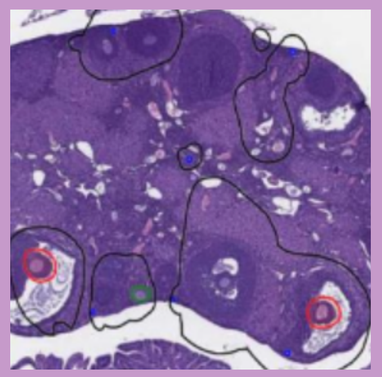
STUDY DESIGN

- 40 slides of mouse ovaries
- 2 sections per slide, H&E staining
- Digital whole slide images (WSI) scanned
- Uploaded to cloud-based Aiforia software
- AI model developed with Aiforia Create

WORKFLOW

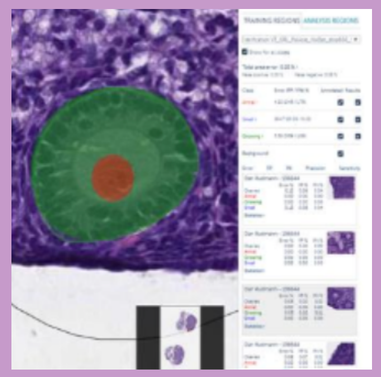


Training set:
30 scanned slides
uploaded to cloud-based
Aiforia software

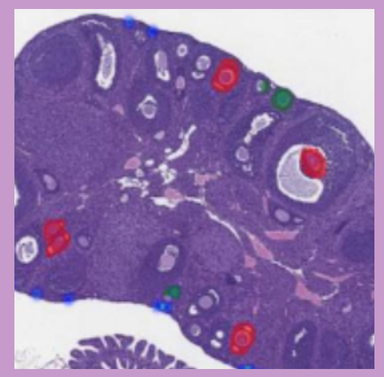


Training annotations
with Aiforia Create

Neural network training
with Aiforia Create



Verification:
NN results compared
to annotations



Deploy the AI model to new images

BENEFITS OF AI-ASSISTED ANALYSIS

Eliminate laborious or repetitive functions for pathologists

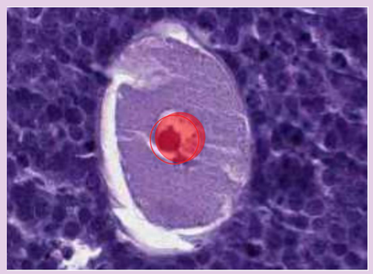
Provide decision support for the identification of findings

Cloud based (Aiforia) means low entry point and supports remote access

RESULTS

The trained CNN delineated with a high level of concordance the three different follicle classes using ground truth established by DR/CS.

- The AI-derived algorithms also processed ovaries much faster than manual counting
- Analysis time 45x faster
- Per whole slide image: ≤8 sec
- Per 10 slide batch (validation): 1 min 25 sec
- Per 30 slide batch (training): 4 min 10 sec
- Manual= Approx 360 sec/slide



CONCLUSIONS

- The AI model identified follicle types without the need for PCNA staining
- The AI methodology with Aiforia increased the efficiency of follicle counting by 45x versus manual counting
- The reproducibility of AI follicle counting between the training and testing sets (>98%) and concordance of AI counts with manual counting by 2 evaluators was very good (93-100%)