IMDRF /DITTA joint workshop
Artificial Intelligence in Healthcare
Opportunities and Challenges

Monday 16 Sept. 2019, Yekaterinburg

AI in Healthcare
Application in Oncology

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**Artificial Intelligence (AI)** is the science and engineering of creating machines or computer programs that can sense, reason, act, and adapt to come up with solutions for problems.

AI by itself is not a solution, rather, **AI is a set of methods** from which solutions can be developed.
WHAT’S DRIVING HEALTHCARE’S NEED FOR ARTIFICIAL INTELLIGENCE?

Growing & aging populations + rise in fatal chronic disease

Accounts for 75% of all deaths by 2020 according to WHO

Escalating healthcare costs

Chronic care accounts for 70-80% of EU healthcare costs

Operational inefficiencies

Image assessment accuracy declines after 8 hours work

Staff shortage

±12.9 m skilled professionals by 2035

Value-based reimbursement

Annual USA spending on health set to grow 5.5% (av.) in 2017 - 2026
Clinicians have access to more data than ever, but too little time! And today, 75% of healthcare data is still unstructured (captured in various sorts of medical notes). This is a huge opportunity!

**Operational optimization**
- Patient scheduling
- Scanner utilization
- Prior exams identification

**Empowering patients**
- Embeds data into solutions that enable people to take control over their own health, at home

**Decision support**
- Combines huge datasets to generate a holistic view, leading to better patient outcomes

**Population health management**
Predictive insights in patient populations enable:
- Preventative action
- Reduced health risk
- Reduced costs
PRODUCT HIERARCHY FOR AI IN MEDICAL IMAGING

- **Automated diagnosis**
  - Differential diagnosis to aid decision making

- **Decision support**
  - Data aggregation and summarization

- **Quantitative imaging**
  - Segmentation, visualization and quantification

- **Automated detection**
  - Automated detection of image features

- **Workflow & reporting**
  - Automated tools to boost productivity
AI IN ONCOLOGY

Solutions based on AI modules may help patients receive fast and accurate diagnosis

Overall benefits:

• Improve the precision and accuracy of routine diagnosis
• Automatically detect and quantify cancerous lesions in cancer tissue
• Analyse vast amounts of data and automatically detect patterns and make accurate predictions
AI IN LUNG CANCER SCREENING IN PRACTICE

CT Lung Nodule Assessment application offers an advanced imaging package that can be used in both diagnostic and screening evaluations, supporting Low Dose CT Lung Cancer Screening\(^1\).

- Pre-fetch of relevant priors
- Automatic preprocessing
- Studies registration from different time points
- Automatic lung segmentation
- CAD for automatic nodule detection
- Semi-automatic nodule
- Automatic nodules match between time points
- Prediction Risk Calculator (Vancouver model)
- Data integration according to guidelines (LungRADS, Fleischner)
- Prefills based on nodules characteristics (via DL)

\(^1\) The screening must be performed within the established inclusion criteria of programs/protocols that have been approved and published by either a governmental body or professional medical society. Please refer to clinical literature, including the results of the National Lung Screening Trial (N Engl J Med 2011; 365:395-409) and subsequent literature, for further information.
Note: The system also learns from the user.
AI MODEL IN LUNG CANCER SCREENING

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https://arxiv.org/abs/1804.01901
A lot of Russian Industrial members have been working on AI models development and validation, as example one of the AI model performance on ultra low dose CT for Lung cancer screening has been validating based on data provided by the Research and Practical Clinical Center of Diagnostics and Telemedicine Technologies (Moscow, Russia)

CHALLENGES: AI ALGORITHM TRANSFERRING INTO PRACTICE

How the collection, preparation of the data are done
- Data aggregation
- Data composition
  - Data anonymization
  - Patient agreement receiving
  - How we can check a data set for model learning

What learning and validation method to choose for a model
- Model set up and insights receiving
- Clinical validation
  - Where to store data set for model studying
  - % of consistency of Model result vs. specialist
  - How to define a class risks of a model

How to realize the transfer of a model to practice
- Testing and integration
- Joint usage of algorithms
  - How to assure the stable status after validation for the diagnostic purpose
CONCLUSION

Artificial Intelligence holds a lot of potential for healthcare, however it should be remembered that AI by itself is NOT a solution rather, it is a set of methods.

We believe artificial intelligence can be applied in a meaningful way that improves people’s lives.

- Enhances the people who use it
- Adapts to the context
- Embedded into the workflow
- Innovates across the health continuum
Thank you!
Спасибо!

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