

AI in Cancer Research and Treatment

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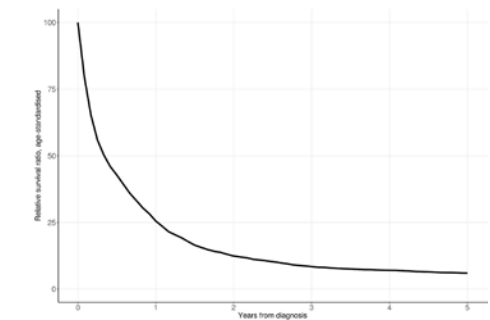
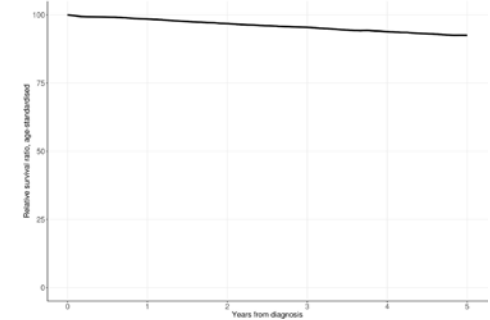
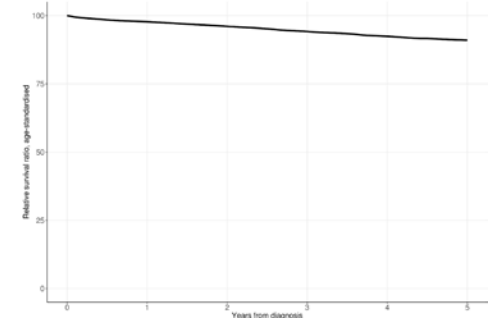


@Sampsa_H
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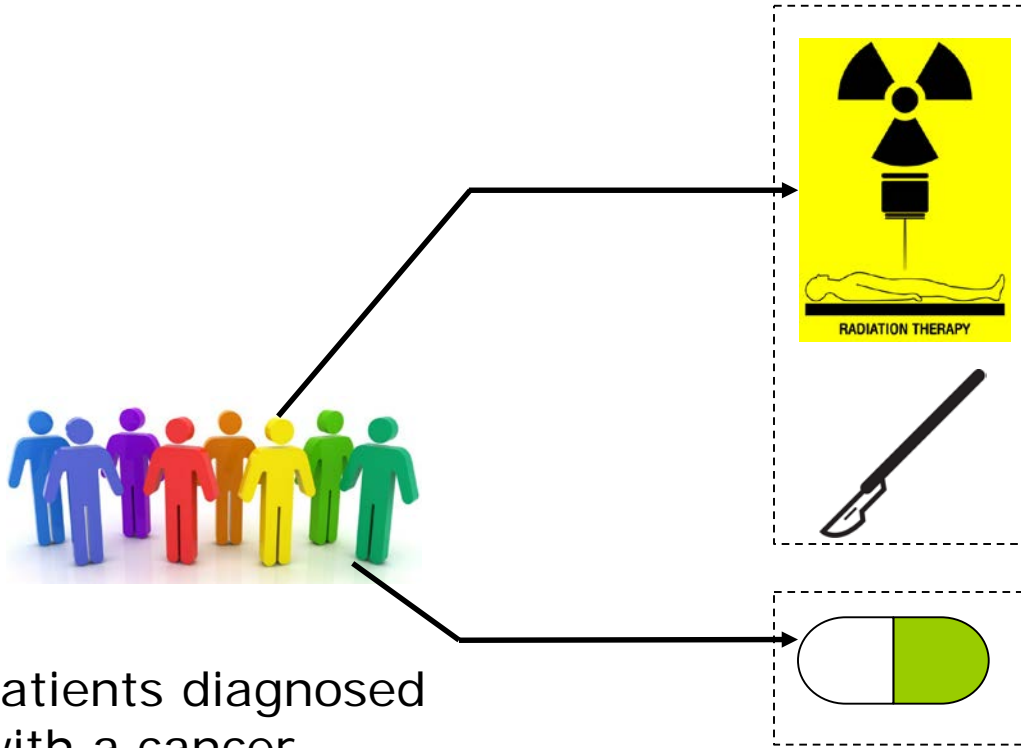
Cancer treatment



Patients diagnosed with a cancer. Standard therapy to all.

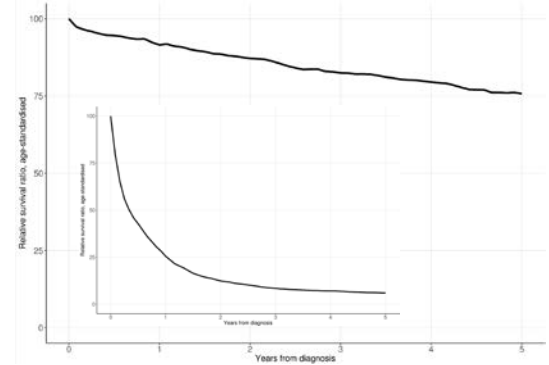


Precision oncology



Patients diagnosed with a cancer.

- Cancer's individual vulnerabilities used in planning the treatments.

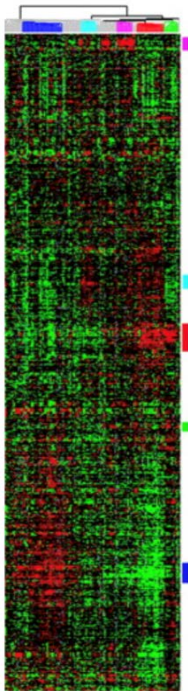


Precision oncology – How to get there?

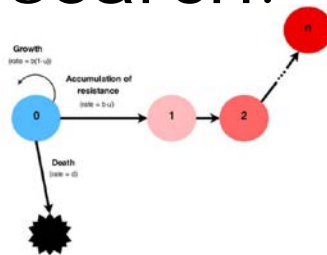
- ❑ More effective treatment options can come only through cancer research.
- ❑ It is easy to measure DNA, gene activities, protein abnormalities *etc.* from a tumor at a single cell level.
- ❑ AI is an integral part of cancer research and in making precision oncology reality.

AI in cancer research

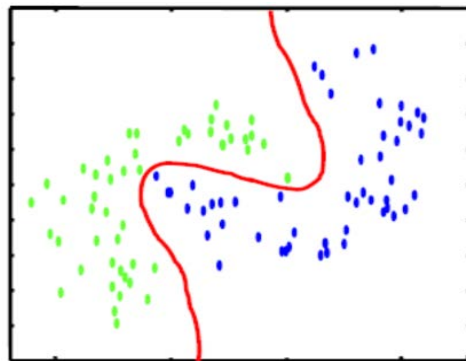
- AI/Machine learning/computational methods have been used for decades in cancer research.



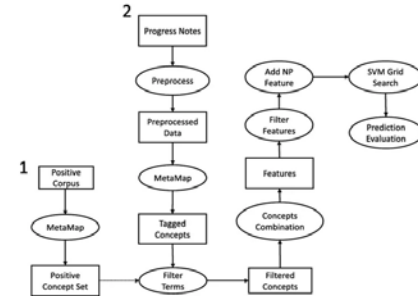
Clustering



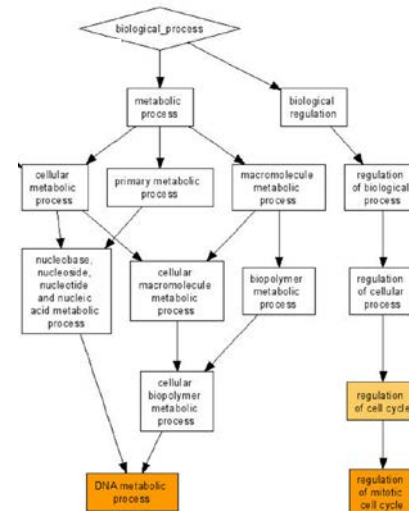
Mathematical modeling



Prediction



Natural language processing



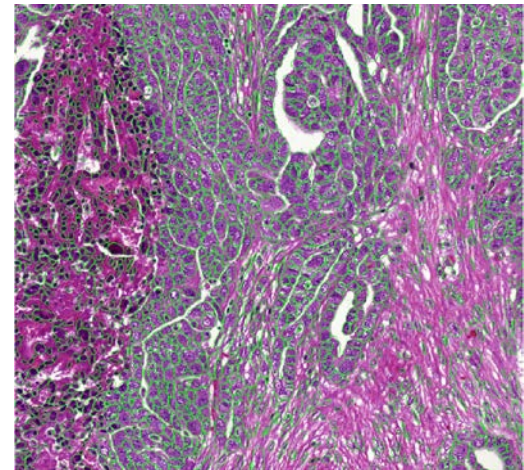
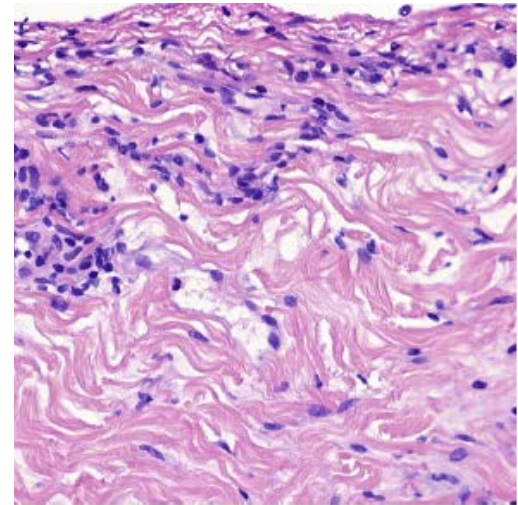
Ontology

AI in cancer treatment

- Cancer treatment consists of three major steps:
 1. Diagnosis
 2. Prognosis
 3. Intervention & follow-up
- Most of AI applications take place in the diagnosis step.
 - **Pathology**
 - Radiology

AI in pathology (digital pathology)

- ❑ The cornerstone of cancer diagnosis is pathologist's report.
- ❑ The questions for an AI system are plenty:
 - What is grade and stage of the sample?
 - What cell types are present in the sample?
 - What is the fraction of cells with certain mutations?

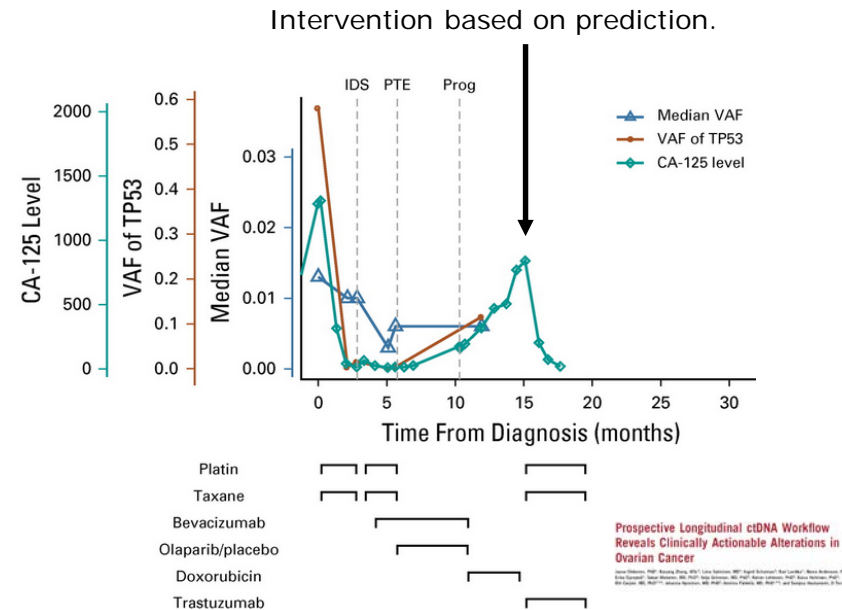


AI in prognosis

- Currently, gene expression signatures and mutations can be used to predict cancer patients' survival in many cancers.
 - Directly useful for planning treatments.
- Also, several reasoning and ontology based methods available.
- Current algorithms often decision tree like.

AI in treatment

- Methods that identify clinically actionable drugs for cancer patients already exist.
- The most difficult part in making AI reality in cancer treatment is not algorithms but regulatory issues.
 - In Finland, we have created complete unique obstacles that prevent the most recent drugs to be used.



Tehokas lääke evättiin munasarjasyöpää sairastavilta naisilta: "Lääkettä, jonka olen ehtinyt jo luvata munasarjasyöpää sairastavalle perheenäidille, ei yhtäkkiä saakaan"



Ulla Puistola,
2016

Suomen Syöpäyhdistyksen mielestä on tärkeää, että:

- Potilaat saatetaan yhdenveroiseen asemaan, saavatpa he lääkkeensä tablettina tai liuoksena: potilaalle annetaan hänen tarvitsemansa tablettimuotoiset syöpälääkkeet sairaalasta, jos vastaavaa lääkettä ei ole saatavana suoneen annettavassa muodossa, niin kauan kunnes lääkkeelle saadaan korvattavuus

Summary

- AI methods are integral part in cancer research and soon also in cancer treatment.
- There are rarely plug-and-play opportunities.
 - Data from clinical samples or data typically require a lot of work in before it is possible to apply any advanced computational method.
- Finland is in excellent position to harness the power of AI in cancer research and treatment.
- Regulatory obstacles need to be overcome.