PRECISE-MD

Pancreatic Ductal Adenocarcinoma and Hepatocellular Carcinoma:
Advancing Diagnostic Strategies Through Multicenter Data Integration and Biomarker Development

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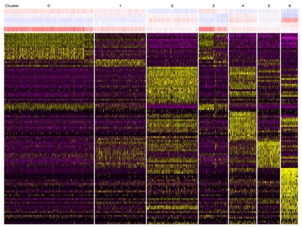
Klinikum rechts der Isar
Technische Universität München

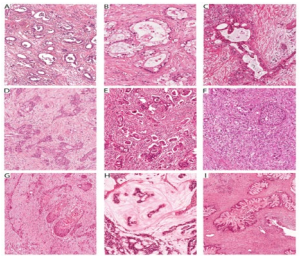
10.10.2024

Personalisierte Bildgebung

Biologie

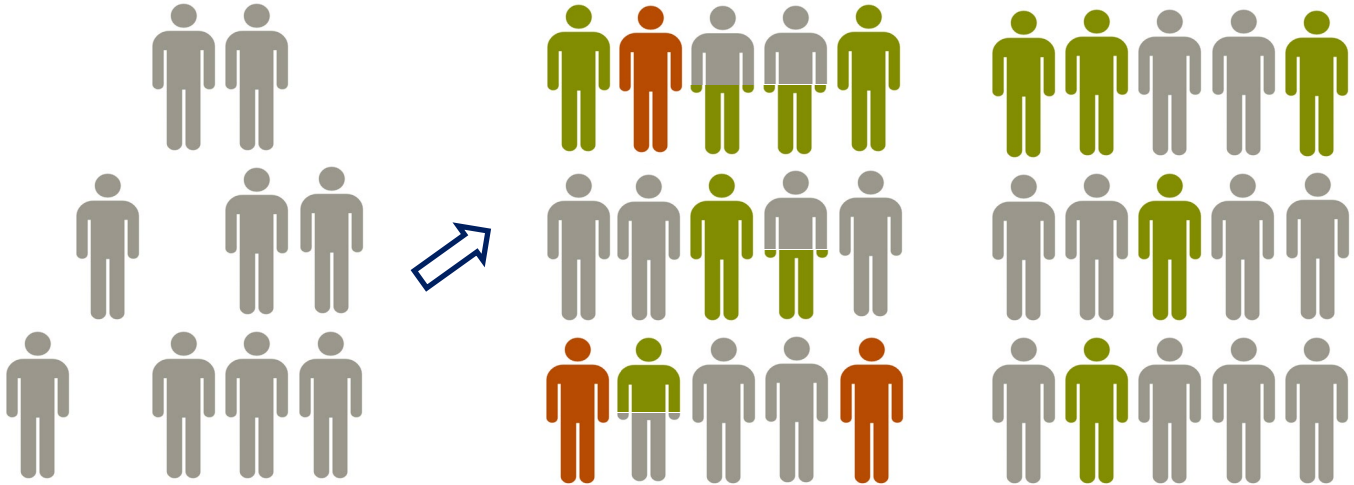


Schlitter, 2017



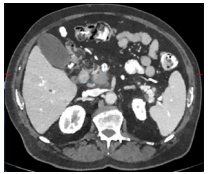
Kalimuthu, 2019

Klinik



Vielfalt nicht-invasiv abbilden für eine individualisierte Diagnostik und Intervention

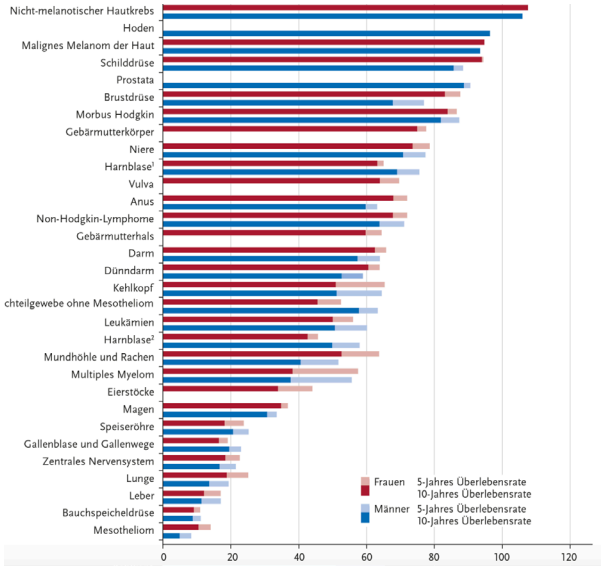
Parametrisierung der Bildgebung

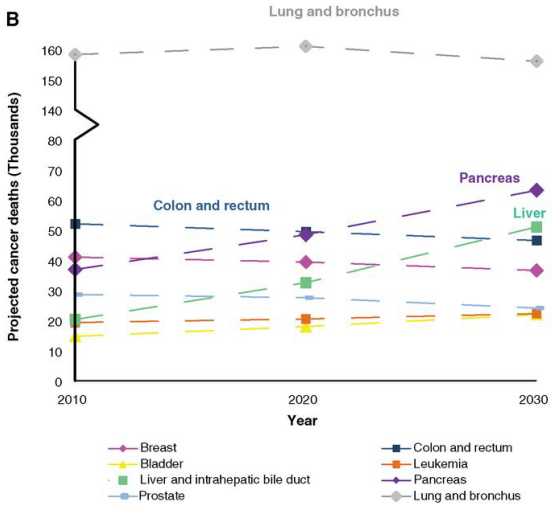


Tumorstadium
?

Georgios Kaissis, PLoS One. 2019 Jan 2;14(1):e0208717; Alina Dima, arXiv:2309.08481; file:///Users/rickmerbraren/Downloads/vessel_tree_p00001_coarse.html

Überlebensraten

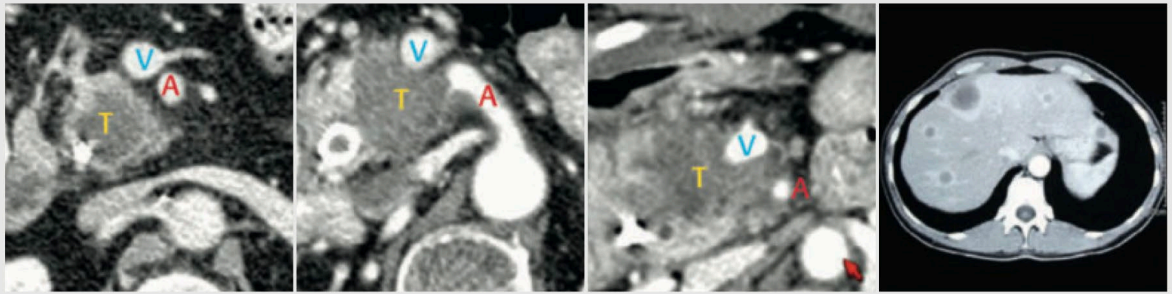




https://www.krebsdaten.de/Krebs/DE/Content/Krebsarten/Krebs_gesamt/krebs_gesamt_node.ht

Rahib et al. (2014) Cancer Res. 74(11):2913-2921

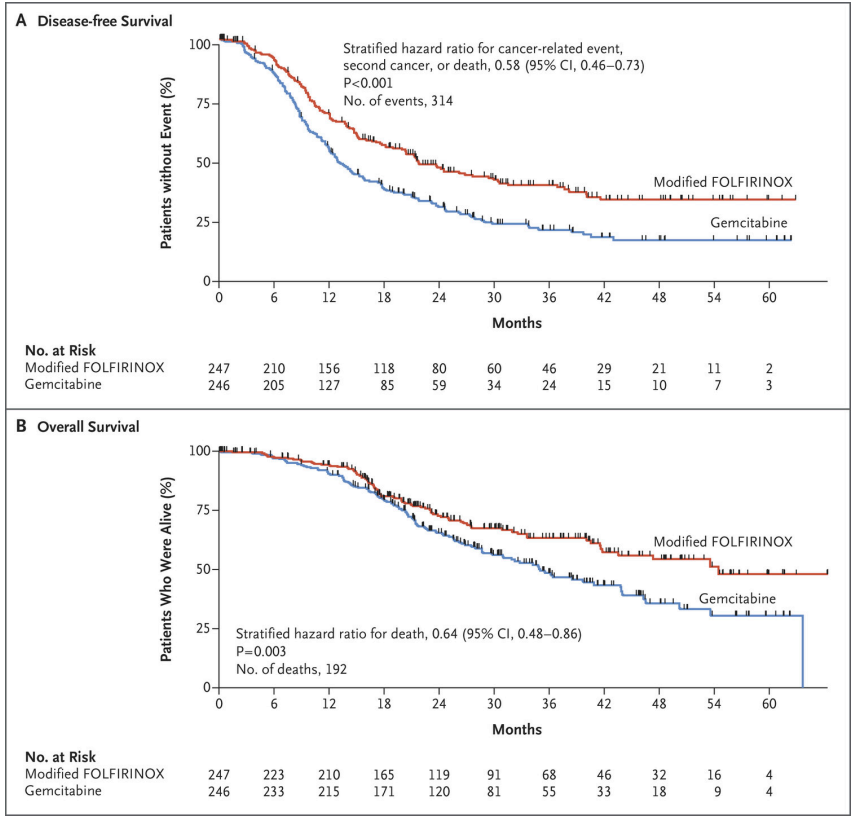
Stadien-abhängige Therapie
Pankreaskarzinom



Inzidenz	**20%**	**5–10%**	**20%**	**50–60%**
tumorbedingte Veneninfiltration/ Metastasen	keine/geringe tumorbedingte Veneninfiltration	moderate tumorbedingte Veneninfiltration	ausgeprägte tumorbedingte Veneninfiltration	metastasiert
Resektabilität	resektabel	borderline	irresektabel	keine Resektion
erreichbarer R-Status	R0	R1 wahrscheinlich	R2 wahrscheinlich	R2
Rolle primärer OP	gut	suboptimal	kein Benefit	kein Benefit
Überleben	20–24 Monate	abhängig von Resektabilität	9–15 Monate	6–12 Monate

Therapieoptionen Pankreaskarzinom

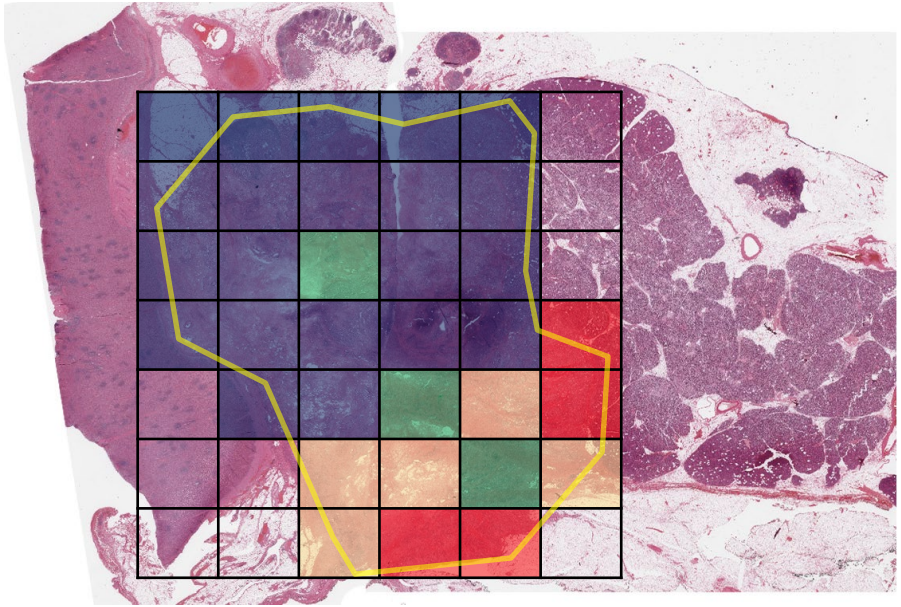
- ECOG 0-1 und < 80 Jahren:
  - mFOLFIRINOX
- ECOG > 1:
  - Gemcitabin oder Gemcitabin + Capecitabin



QI B

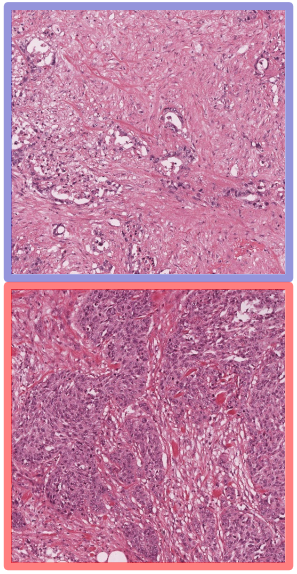
Radiologisch pathologische Korrelation

Heterogenität des duktalen Pankreasadeno-Ca



Tumor cells
- <10%
- 10%-30%
- >30%

Necrosis
- >50%



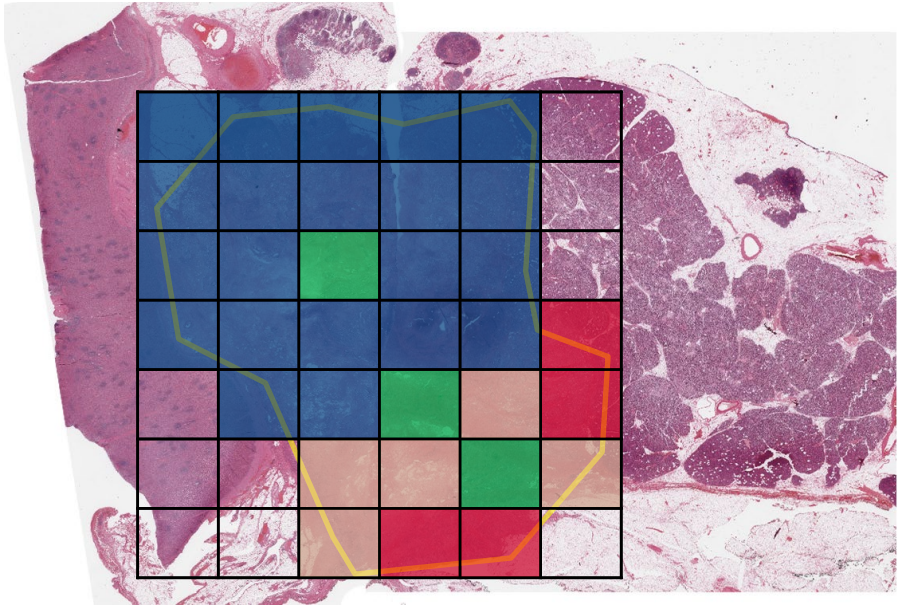
- tumor cellularity/heterogeneity grading (-> none, low or high)

QI B

Radiologisch pathologische Korrelation

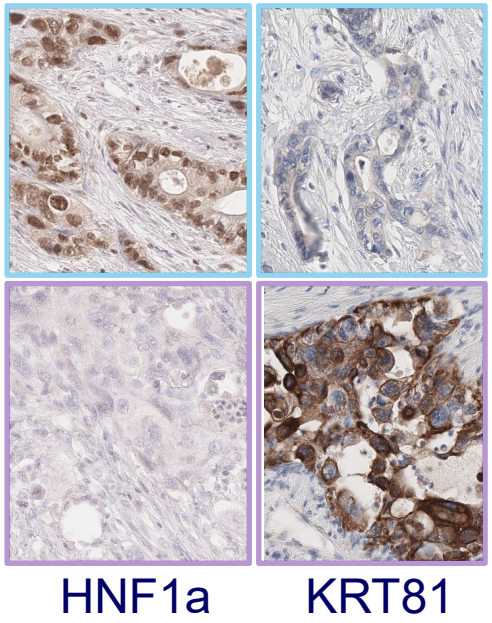
Heterogenität des duktalen Pankreasadeno-Ca

SFB 824



IHC
- HNF1a
- KRT81

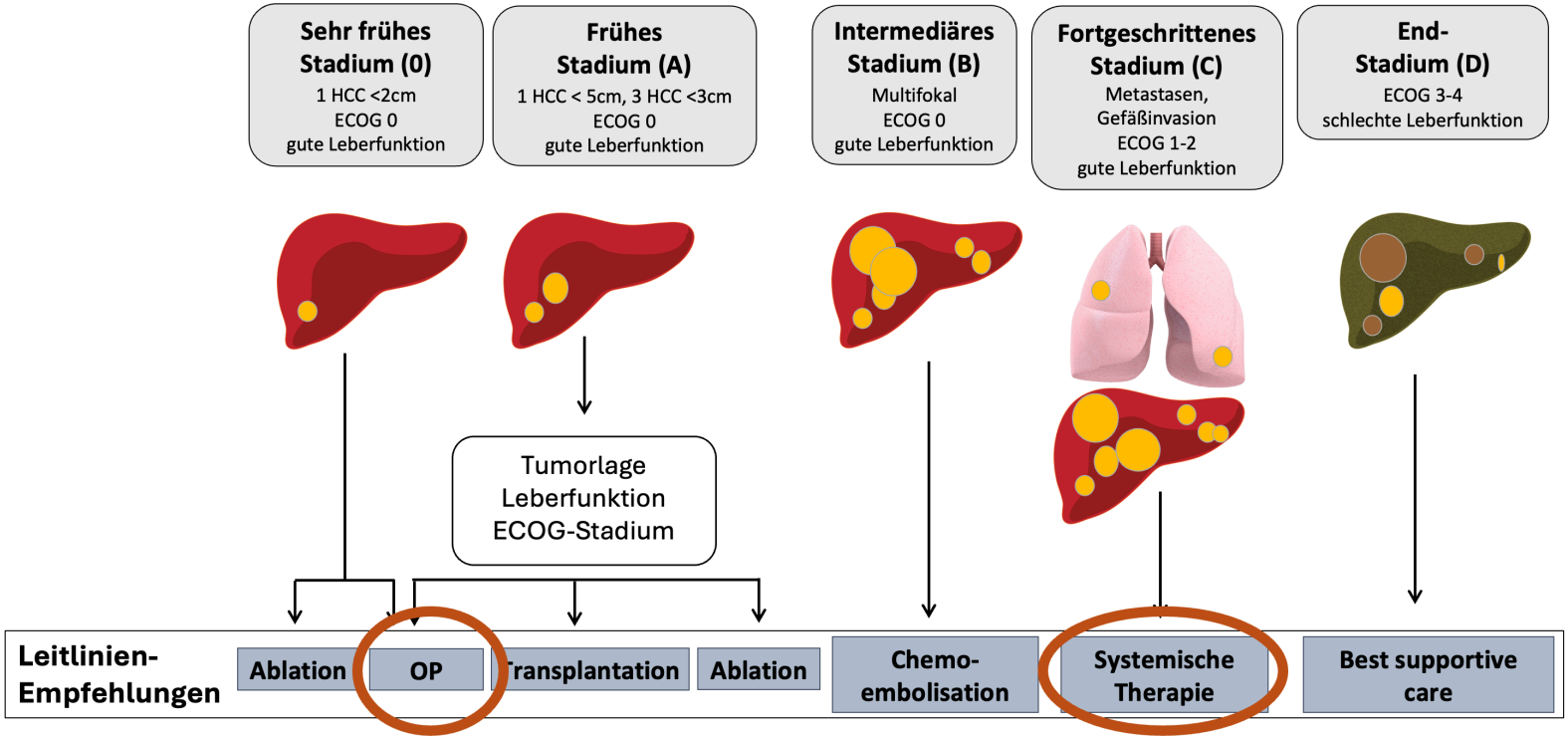
Necrosis
- >50%



HNF1a KRT81

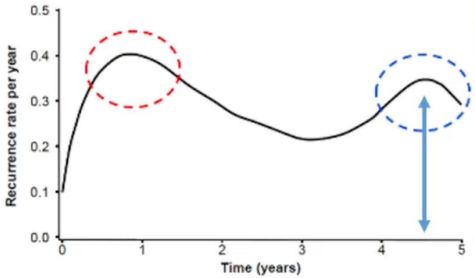
- tumor cellularity/heterogeneity grading (-> none, low or high)

Stadien-abhängige Therapie
Hepatozelluläres Karzinom



Therapieoptionen Hepatozelluläres Karzinom

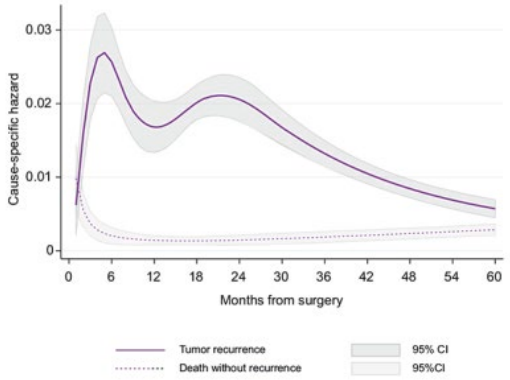
249 patients who underwent hepatectomy for HCC in Japan

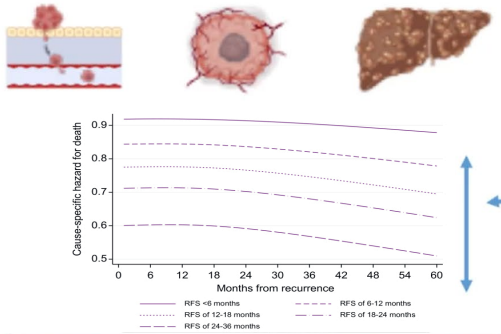


- Factors related to early recurrence were non-anatomical resection, microvascular invasion, and AFP
- Those contributing to late recurrence were grade of hepatitis, multiple tumors, and tumor grading

Imamura H et al J Hepatol 2003

813 patients with HCC in metabolic syndrome from 24 Western centers





Timing of recurrence significantly impacts survival

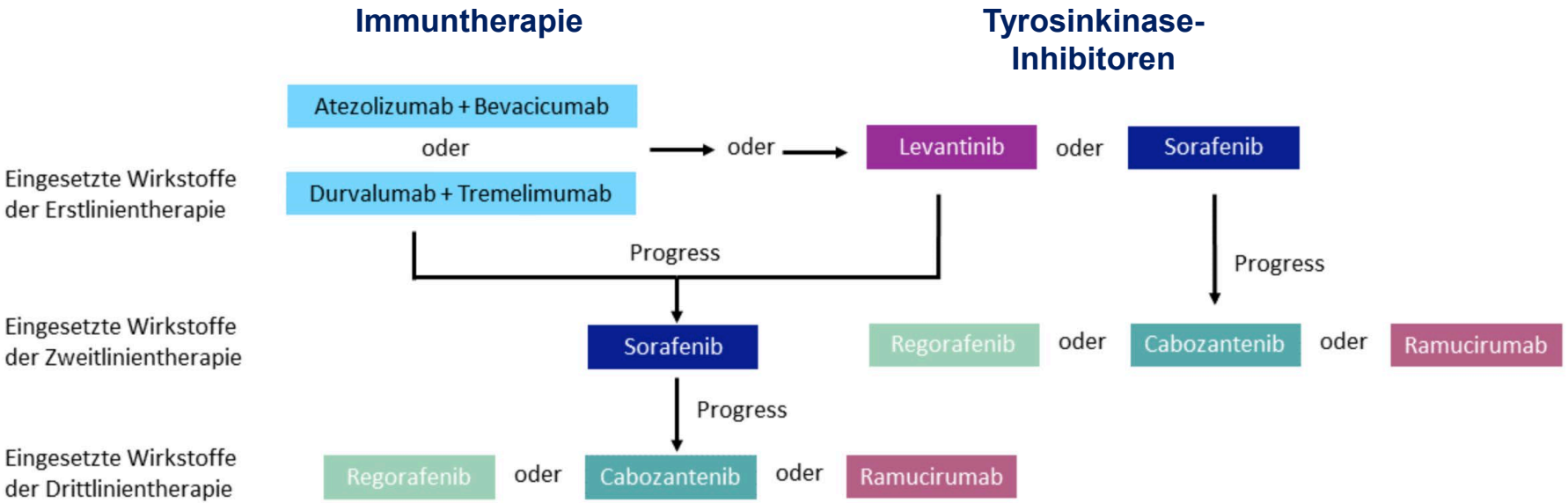
Peaks of cause-specific hazard of recurrence: 6 months and 24 months

Time-specific hazards depend on tumor-related factors and liver disease

- **Aggressive tumor in absence of cirrhosis** will most likely recur early after surgery, will not be amenable to curative treatment strategies and will bear poor survival.
- **Indolent tumor with underlying cirrhosis** have increased hazards of recurrence starting 2 yrs after surgery, treatment will likely have a curative intent, eventually displaying good survival.
- **Presence of cirrhosis and negative tumoral features are persistently at high risk of recurrence.**

Berardi G et al JHEP Rep 2023

Therapieoptionen
Hepatozelluläres Karzinom

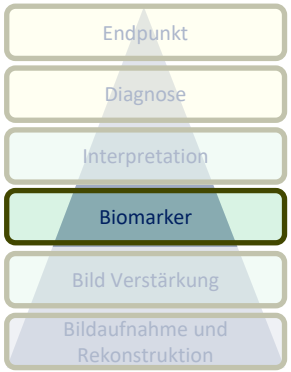


https://www.leberkrebshilfe.info/systemische-therapie.html

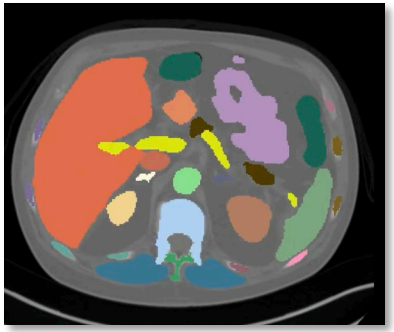
AI

Parametrisierung der Bildgebung

Total Segmentator & Co

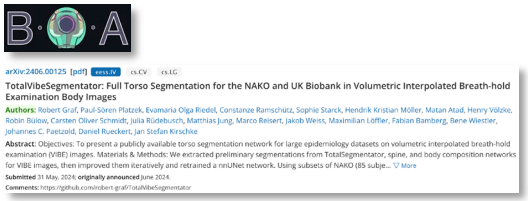


CT



MRT

- Vergleich innerhalb gematchter Kohorten
- Vergleich mit Gesunden



arXiv:2406.00125 [pdf] eess.IV cs.CV cs.LG

TotalVibeSegmentator: Full Torso Segmentation for the NAKO and UK Biobank in Volumetric Interpolated Breath-hold Examination Body Images

Authors: Robert Graf, Paul-Sören Platzek, Evamaria Olga Riedel, Constanze Ramschütz, Sophie Starck, Hendrik Kristian Möller, Matan Atad, Henry Völzke, Robin Bülow, Carsten Oliver Schmidt, Julia Rüdebusch, Matthias Jung, Marco Reisert, Jakob Weiss, Maximilian Löffler, Fabian Bamberg, Rene Wiestler, Johannes C. Paetzold, Daniel Rueckert, Jan Stefan Kirschke

Abstract: Objectives: To present a publicly available torso segmentation network for large epidemiology datasets on volumetric interpolated breath-hold examination (VIBE) images. Materials & Methods: We extracted preliminary segmentations from TotalSegmentator, spine, and body composition networks for VIBE images, then improved them iteratively and retrained a nnUNet network. Using subsets of NAKO (85 subje... ▽ More

Submitted 31 May, 2024; **originally announced** June 2024.

Comments: https://github.com/robert-graf/TotalVibeSegmentator

Prädiktive Biomarker Pankreaskarzinom

Muskelverfettung

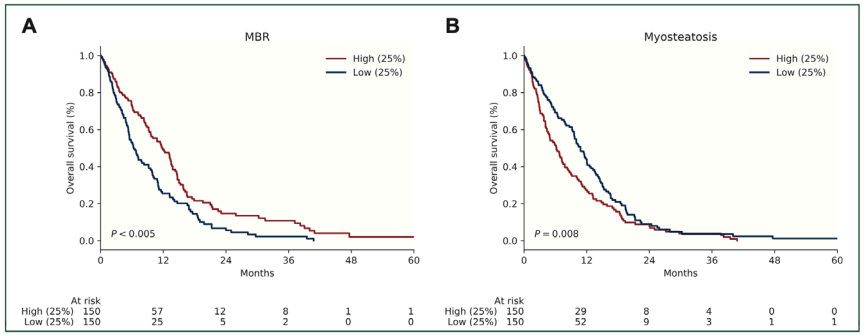
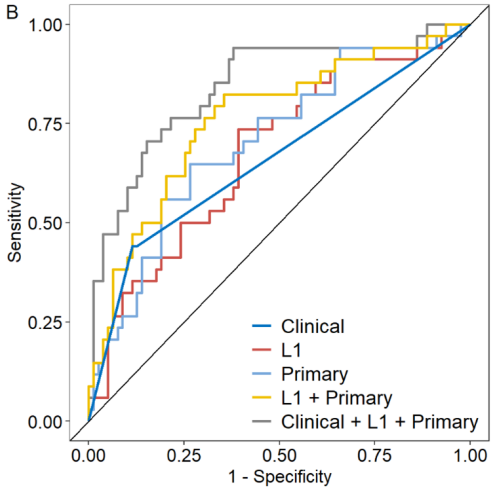


Figure 2. Kaplan–Meier plot showing overall survival according to MBR and myosteatosis in the pooled cohort. (A) Overall survival of patients with high and low MBR. (B) Overall survival of patients with high and low myosteatosis.
MBR, muscle-to-bone ratio.

Tumor Radiomics

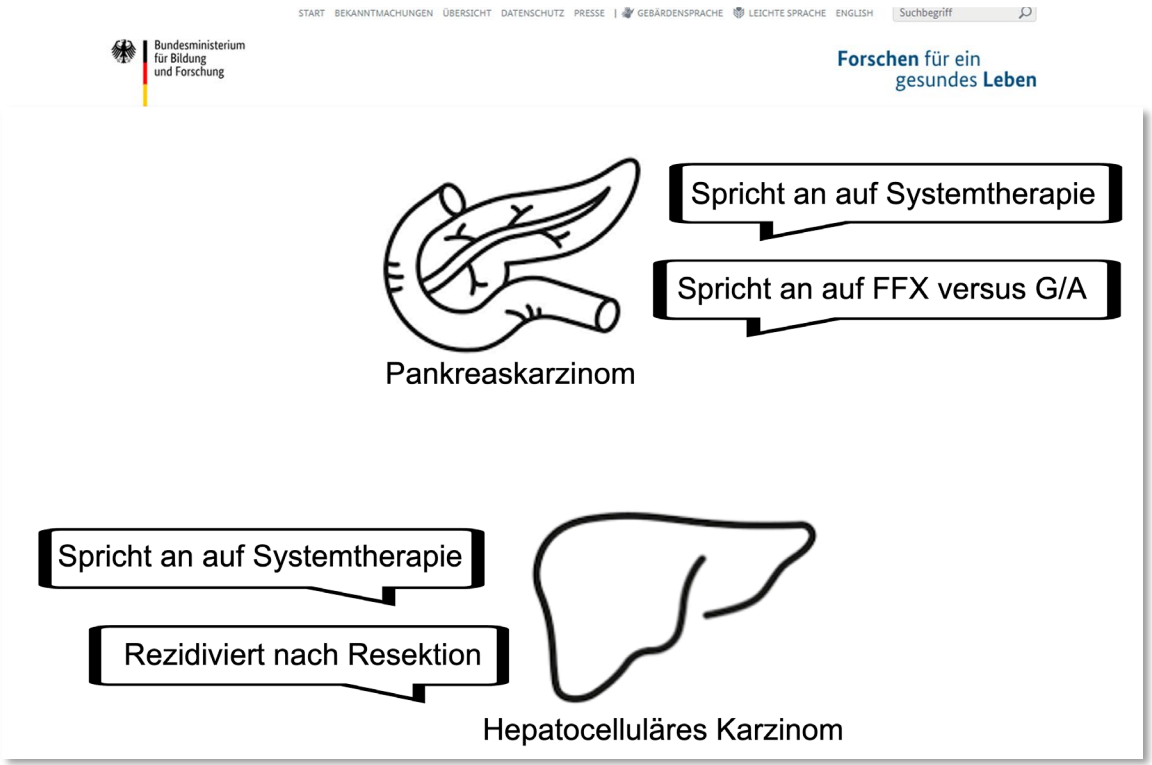


Förderlinie

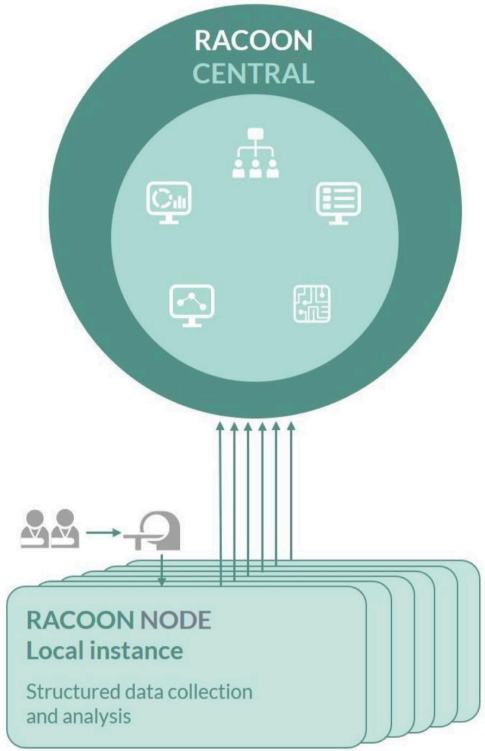
Modul 1: Workshops und Data Challenge Projekte / Datathons

Modul 2: Projekte des föderierten Lernens

Modul 3: Erstellung von qualitätsgesicherten Trainings-, Validierungs- und Testdatensätzen

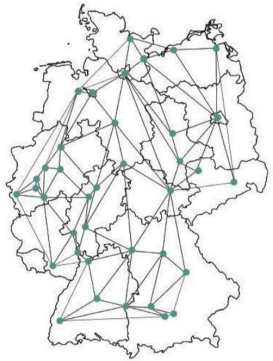


Infrastructure



Secure central environment

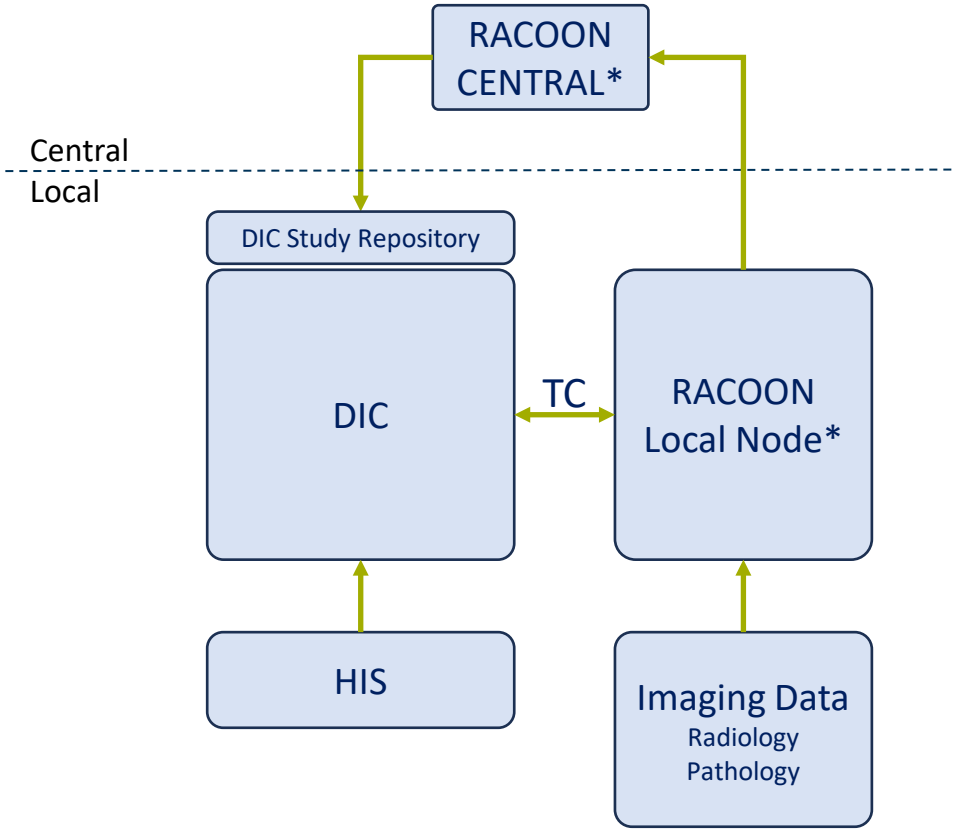
- Data analytics in real time
- Monitoring toolsets
- Equivalent modular components



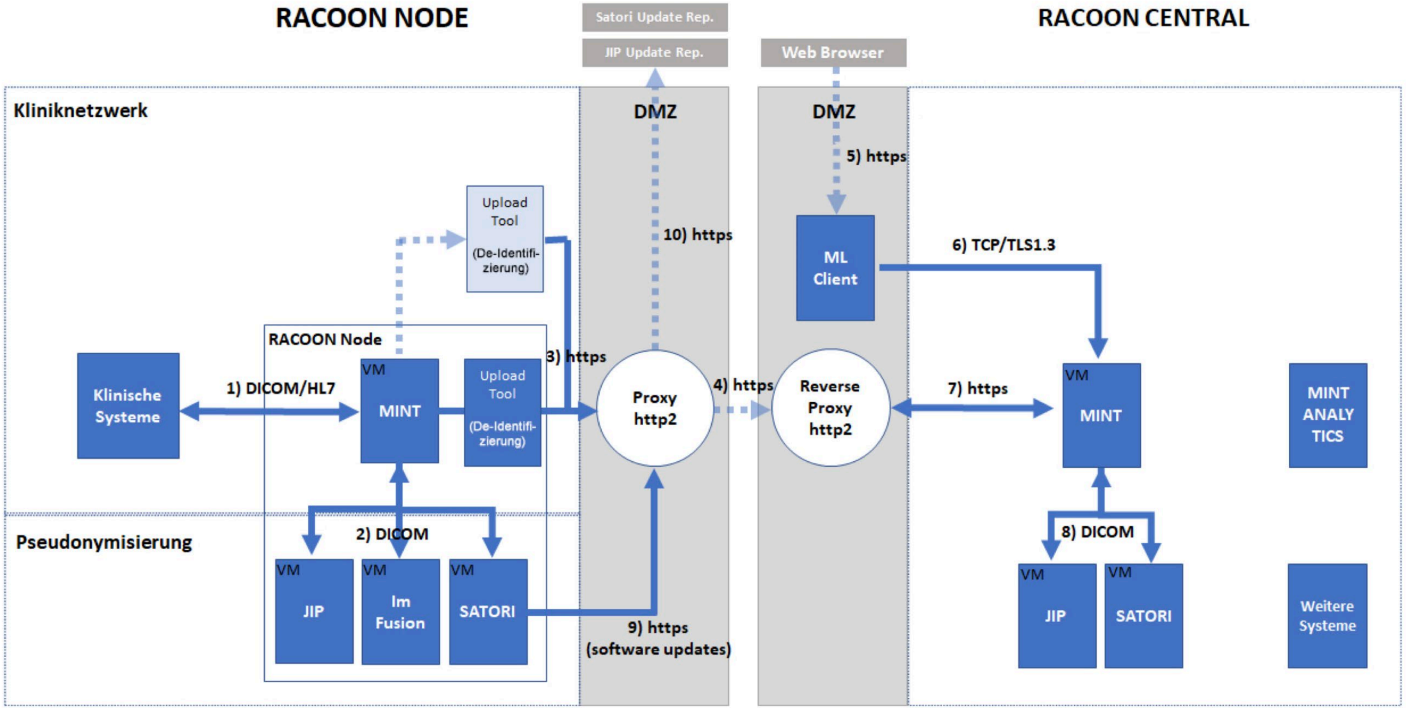
Federated research environment

- Modular components for reporting and anotation
- Support for automated image feature extraction
- AI training of QIBs modules
- Available at all NUM partner sites
- Container-based portable modules

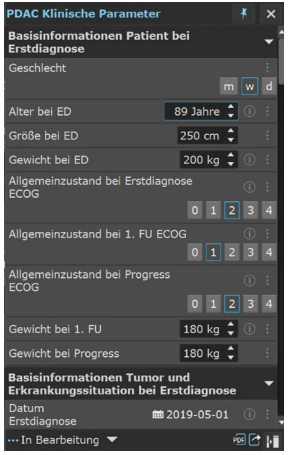
Infrastructure

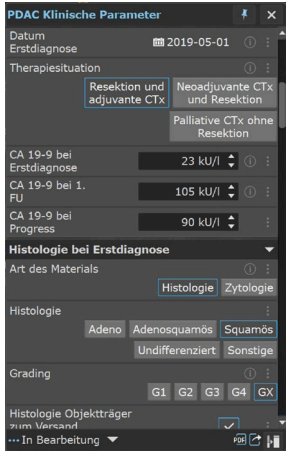


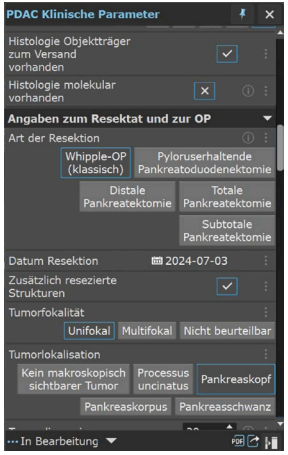
Infrastructure

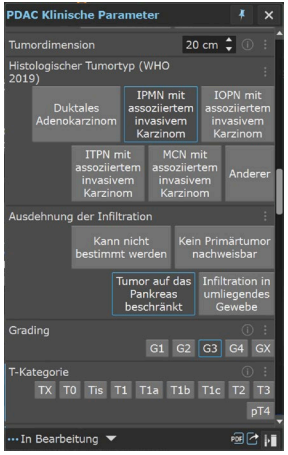


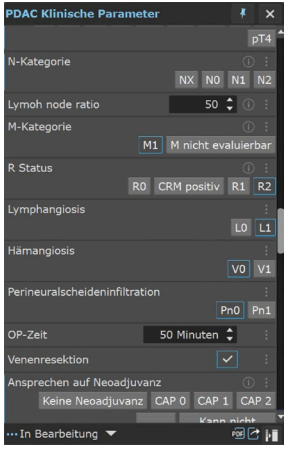
Klinische Datenerfassung

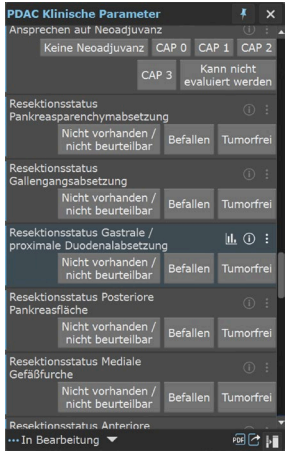


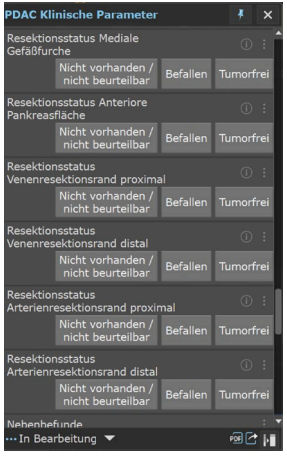


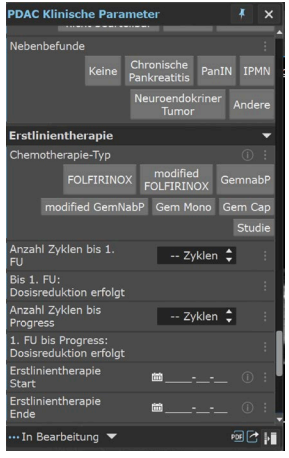


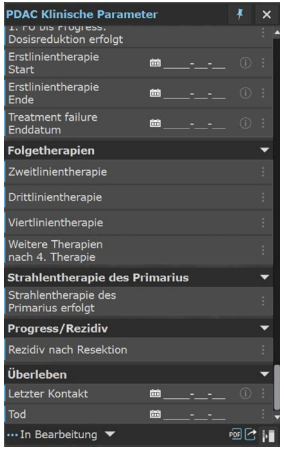






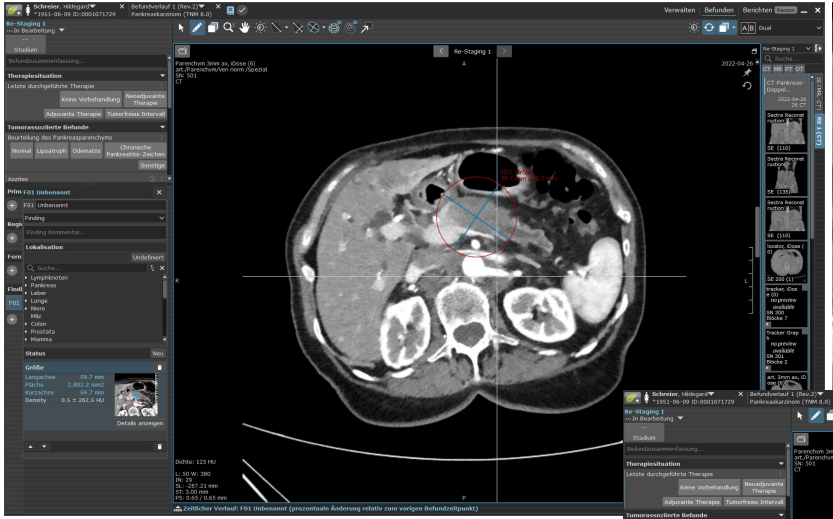


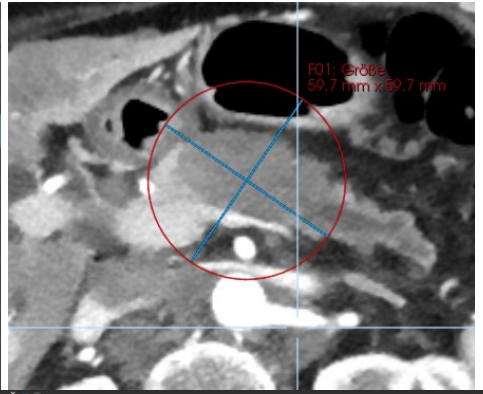


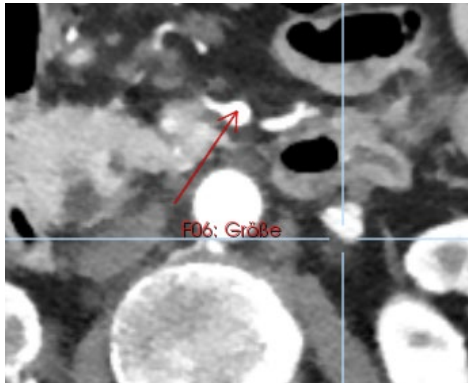


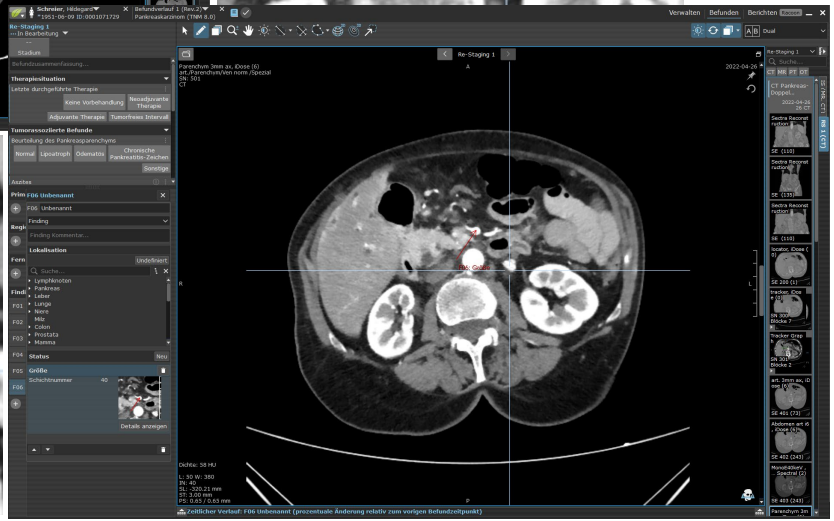
mint medical

Strukturierte Befundung und Bilddaten Annotation

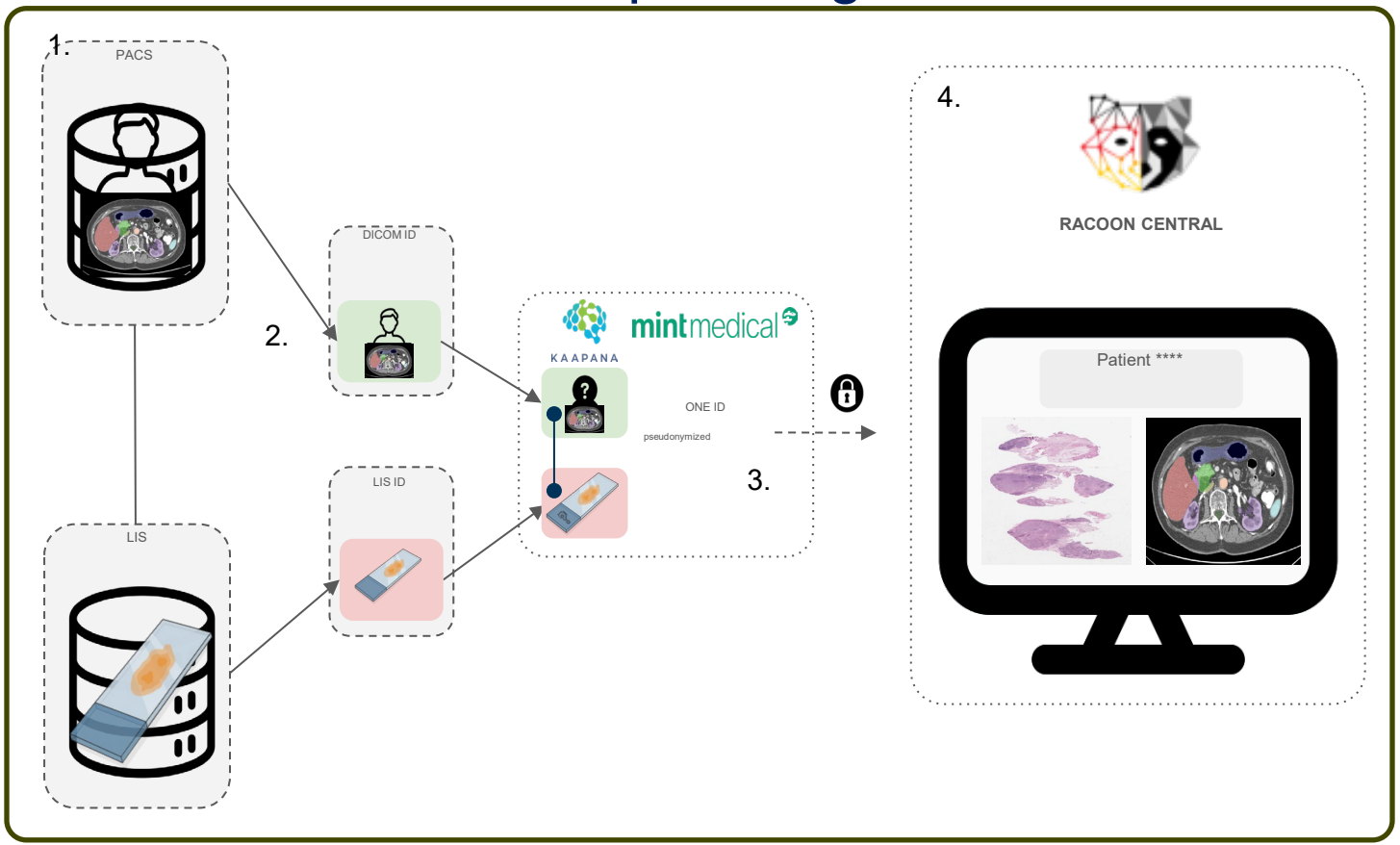








Histopathologie

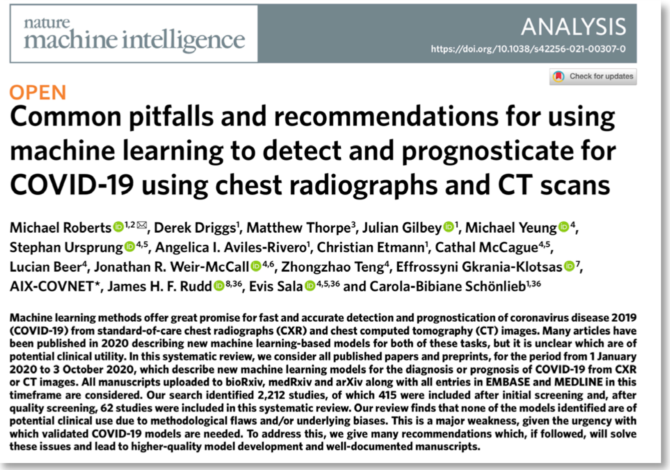


AI

Wo geht die Reise hin?

Academia

„…kein einziger brauchbarer Algorithmus!“ (n=2212)


nature machine intelligence

ANALYSIS

https://doi.org/10.1038/s42256-021-00307-0

Check for updates

OPEN

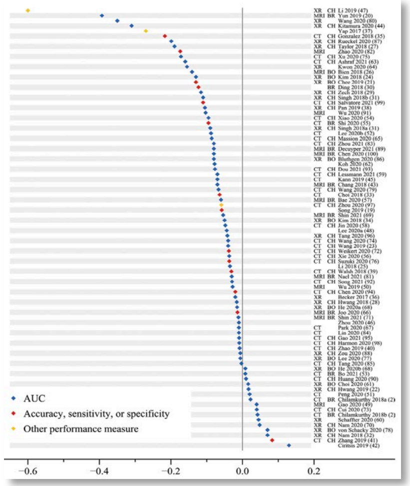
Common pitfalls and recommendations for using machine learning to detect and prognosticate for COVID-19 using chest radiographs and CT scans

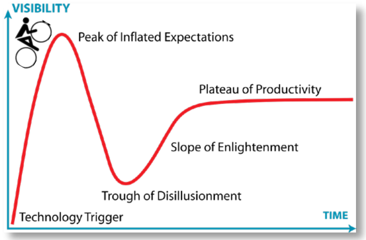
Michael Roberts[1,2], Derek Driggs[1], Matthew Thorpe[3], Julian Gilbey[1], Michael Yeung[4], Stephan Ursprung[4,5], Angelica I. Aviles-Rivero[1], Christian Etmann[1], Cathal McCague[4,5], Lucian Beer[4], Jonathan R. Weir-McCall[4,6], Zhongzhao Teng[4], Effrossyni Gkrania-Klotsas[7], AIX-COVNET*, James H. F. Rudd[8,36], Evis Sala[4,5,36] and Carola-Bibiane Schönlieb[1,36]

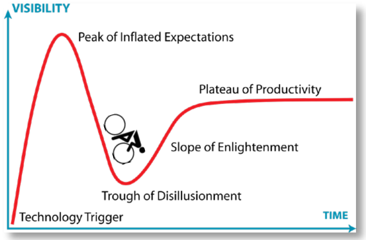
Machine learning methods offer great promise for fast and accurate detection and prognostication of coronavirus disease 2019 (COVID-19) from standard-of-care chest radiographs (CXR) and chest computed tomography (CT) images. Many articles have been published in 2020 describing new machine learning-based models for both of these tasks, but it is unclear which are of potential clinical utility. In this systematic review, we consider all published papers and preprints, for the period from 1 January 2020 to 3 October 2020, which describe new machine learning models for the diagnosis or prognosis of COVID-19 from CXR or CT images. All manuscripts uploaded to bioRxiv, medRxiv and arXiv along with all entries in EMBASE and MEDLINE in this timeframe are considered. Our search identified 2,212 studies, of which 415 were included after initial screening and, after quality screening, 62 studies were included in this systematic review. Our review finds that none of the models identified are of potential clinical use due to methodological flaws and/or underlying biases. This is a major weakness, given the urgency with which validated COVID-19 models are needed. To address this, we give many recommendations which, if followed, will solve these issues and lead to higher-quality model development and well-documented manuscripts.

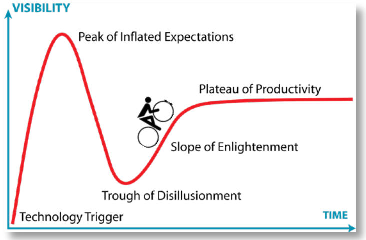
Industry

„…80% der FDA Algorithmen schlechter als









Infrastruktur

Open Medical Inference

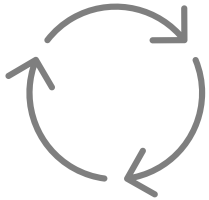
MEDIZIN INFORMATIK INITIATIVE

RACOON-PDAC
RACOON-BI

netzwerk universitätsmedizin

PRECISE-MD

NATIONALE DEKADE GEGEN KREBS



Leuchtturm KI u. Bioinformatik
BORN

BZKF Bayerisches Zentrum für Krebsforschung

Oncoverse

50 Jahre Deutsche Krebshilfe
HELFEN. FORSCHEN. INFORMIEREN.

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UniversitätsKlinikum Heidelberg

UKR Universitätsklinikum Regensburg

UNIVERSITÄTS KLINIKUM ulm

SIGILLUM FACULTATIS MEDICINAE MAGDEBURGENSIS

UKRUB UNIVERSITÄTSKLINIKUM DER RUHR-UNIVERSITÄT BOCHUM

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UKM Universitätsklinikum Münster