Abstract
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Background
- Bevacizumab has significantly improved the resectability, response rate as well as survival of patients with initially unresectable Colorectal Cancer Liver Metastases (CRLM).
- More than half of these patients were insensitive to bevacizumab therapy. Identification of patients who are sensitive to bevacizumab therapy may improve the response rate and reduce the adverse event.
- In this study, we aimed to construct and validate a fused PET/CT deep radiomics model (DERBY+) to predict bevacizumab efficacy in initially unresectable CRLM patients.

Methods
- The PET/CT image features were extracted using a deep learning signature, and we used a using a Gaussian mixture model to convert the high-dimensional deep features into a compacted multi-scale representation. Then, DERBY+ developed by combining clinical and additional protein features.
- The training cohort and negative validation cohort of this study is derived from the BECOME study.
- After model construction, we validated the model in different validation cohorts from two centers.

Results
- DERBY+-predicted responders has longer PFS (A&C) and OS (B&D) than non-responders in histology and external validation cohort.
- The deep learning score (DLS) performed well in discriminating bevacizumab responders and non-responders (A&C).
- DLS of PR patients is significantly higher than SD+PD patients’ (B&D).
- The performance of DERBY+ is better than clinical, radiomic, and DERBY model in external validation cohort.

Conclusion
- We developed and validated a fused PET/CT deep radiomics model to predict bevacizumab efficacy of CRLM patients, which can help clinicians provide precise medication guidance prior to treatment.