DONNIE KIM

Bioinformatics & Computational Biology, UT MD Anderson Cancer Ctr, Houston, TX, 77030
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Citizenship: South Korea (USA permanent resident)

EDUCATION

MD Anderson UTHealth Graduate School, Houston, TX — *Expected in July 2018*
Master of Science in Bioinformatics
GPA: 3.09/4.00

Rice University, Houston, TX — *May 2015*
Bachelor of Science in Physics
GPA: 3.56/4.33

University of Massachusetts Amherst, Amherst, MA — *Sep 2010 - May 2012*
GPA: 3.81/4.00

RESEARCH EXPERIENCE

MD Anderson UTHealth Graduate School — *May 2016 - Present*
Advisor: Prof. Arvind Rao — *Houston, TX*

· Radiogenomics using Magnetic Resonance Imaging (MRI) scans
- 3D image pre-processing, texture acquisition, and patient outcome modeling in glioblastoma
- Correlation work between MRI texture features with immune response
- Multi-parametric MRI scan analysis to infer genetic alterations in glioblastoma
- Convolutional Neural Network (CNN) analysis of 1p/19q co-deletion status in glioma and glioblastoma

MD Anderson UTHealth Graduate School — *Jan 2014 - May 2016*
Advisor: Prof. Dragan Mirkovic — *Houston, TX*

· Clinical outcome modeling
- GUI development for proton radiation dose distribution and standard uptake value (SUV) visualization
- Deformable and rigid registration analysis in 4D CT scans and between PET and CT scans
- Correlation analysis between proton radiation dose and SUV

SKILLS

1. Medical Image software: 3D Slicer, VelocityAI, CERR
2. Machine Learning Framework: Tensorflow, Keras, Scikit-learn
3. Script Language: MATLAB, Python, R

SCHOLARLY ACHIEVEMENTS

Journal Publications

1. Shivali Narang, **Donnie Kim**, Sathvik Aithala, Amy B. Heimberger, Salmaan Ahmed, Dinesh Rao, Ganesh Rao, Arvind Rao, "Tumor Image-Derived Texture Features are Associated with CD3 T-cell Infiltration Status in Glioblastoma," *OncoTarget*, vol. 8, no. 60, pp. 101244, Sep. 2017.

2. Katherine Dextraze, Abhijoy Saha, **Donnie Kim**, Shivali Narang, Michael Lehrer, Anita Rao, Saphal Narang, Dinesh Rao, Salmaan Ahmed, Venkatesh Madhugiri, Clifton David Fuller, Michelle M. Kim, Sunil Krishnan, Ganesh Rao, Arvind Rao, "Spatial habitats from multiparametric MR imaging are associated with cellular signaling pathway activity and survival in glioblastoma," *OncoTarget*, vol. 8, no. 68, pp. 112992, Dec. 2017.

Poster Presentations

1. **Donnie Kim**, Sathvik Aithala, and Arvind Rao, "Predicting CD3 infiltration status in glioblastoma via MRI radiomics," presented at *Society for Industrial and Applied Mathematics Houston Imaging Sciences Symposium*, Oct 2017.
2. **Donnie Kim**, Uew Titt, and Dragan Mirkovic, "Correlating Dose with SUV from clinical outcome ," presented at *AAPM 2016 Annual meeting & exibition*, Aug 2016.

HONORS AND AWARDS

Summer Scholarship in medical physics with MD Anderson , *Rice University* *2015*

Distinction in Research Honor, *Rice University* *2015*

2014 AAPM DREAM Fellowship, *AAPM* *2014*

Honors Research Fellowship, *University of Massachusetts Amherst* *2012*

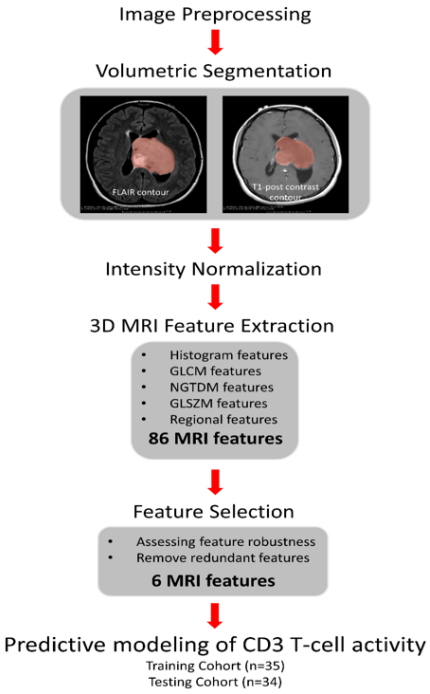
Dean's list, *University of Massachusetts Amherst* *2010-2012*

Chancellor's Award *University of Massachusetts Amherst* *2010-2012*

APPENDIX

Details of Publications

Predicting CD3 T-cell activity via **symbolic regression**

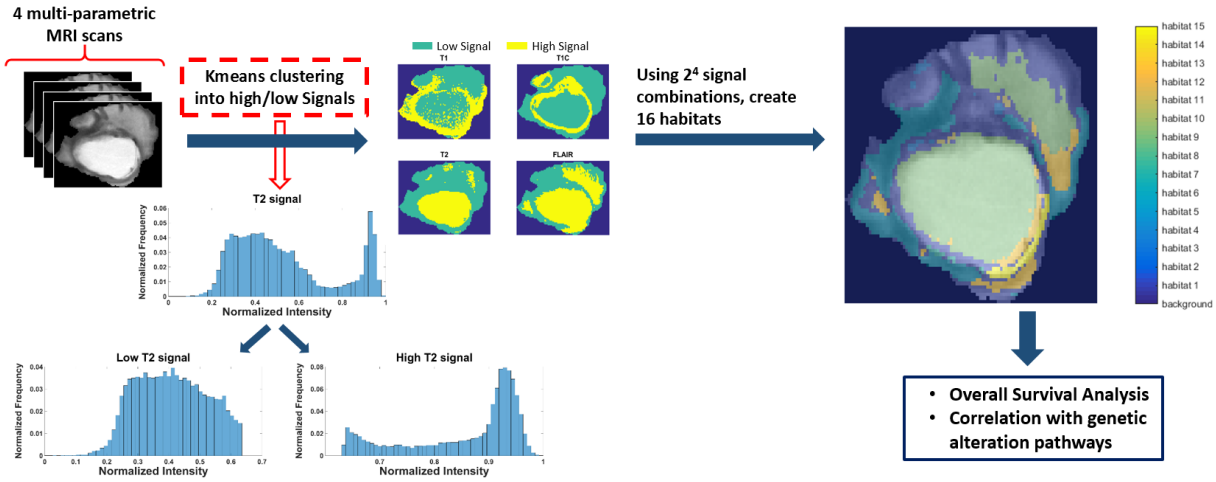


Problem Statement:
CD3 T-cell infiltration into glioblastoma (the most common primary brain tumor) is a powerful predictor of tumor progression and prognosis. **Determining** the CD3 T-cell presence currently requires either a **biopsy or surgery**. Unfortunately, both of these **invasive methods** carry **inherent risks** and **sampling biases**.

Our Approach:
As a **non-invasive** approach, we extracted 3D MRI texture features to investigate CD3 T-cell infiltration. Our **symbolic regression** model yielded **AUC of 0.847** in the test cohort.

Related publication:
D. Kim et al. Tumor Image-Derived Texture Features are Associated with CD3 T-cell Infiltration Status in Glioblastoma. *OncoTarget*, vol. 8, no. 60, pp. 101244, Sep. 2017.

Identifying tumor heterogeneity **quantitatively via kmeans clustering**



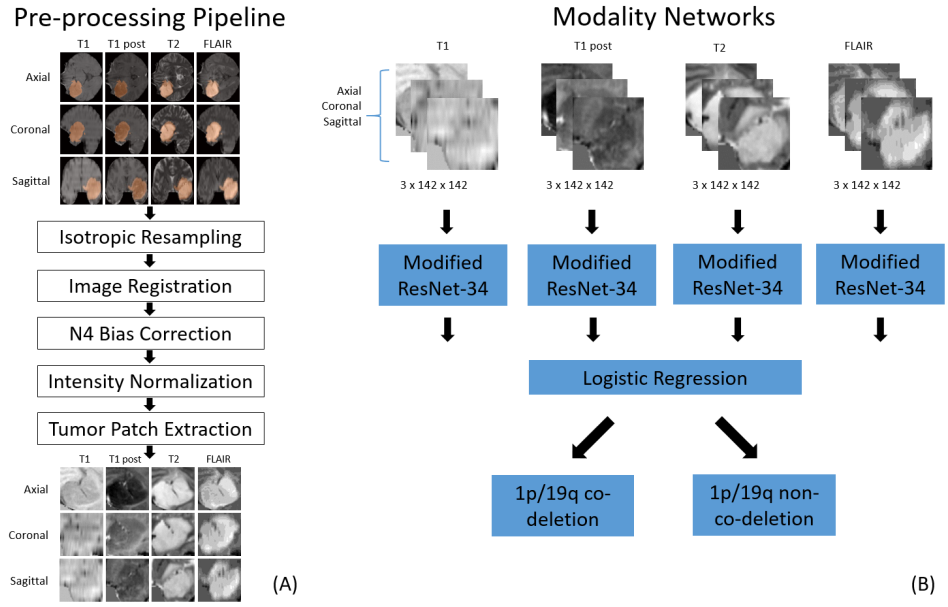
Problem Statement:
Glioblastoma, a primary brain tumor, shows intra- and inter-tumoral heterogeneity. This variation is relevant biologically because it represents the genetic diversity within the tumor. However, currently we lack a quantitative description of this spatial heterogeneity.

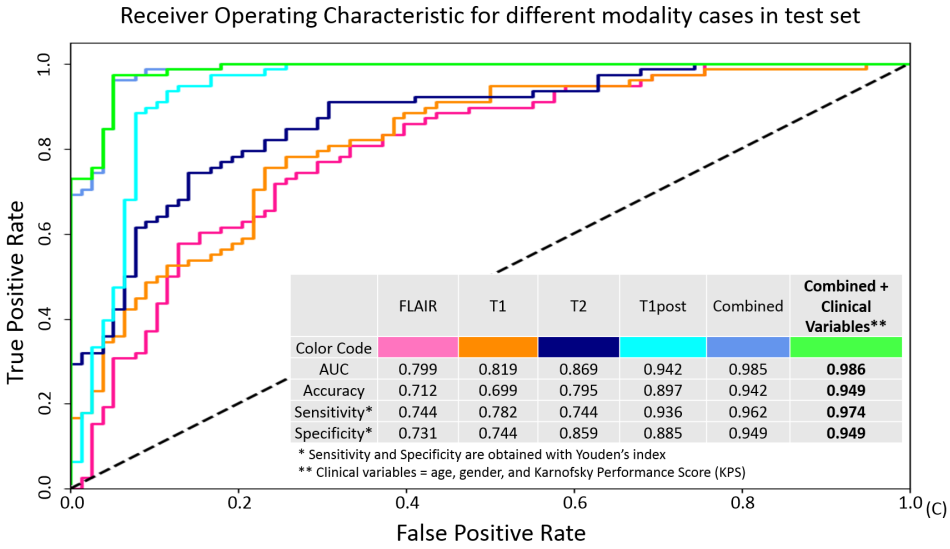
Our Approach:
We identified spatially different sub-regions of the tumor, called habitats via kmeans clustering, and assessed their relevance to overall survival and genetic alterations of patients.

Related publication:
D. Kim et al. Spatial habitats from multiparametric MR imaging are associated with cellular signaling pathway activity and survival in glioblastoma. *OncoTarget*, vol. 8, no. 68, pp. 112992, Dec. 2017.

APPENDIX

Details of Master's thesis project





	FLAIR	T1	T2	T1post	Combined	Combined + Clinical Variables**
Color Code						
AUC	0.799	0.819	0.869	0.942	0.985	**0.986**
Accuracy	0.712	0.699	0.795	0.897	0.942	**0.949**
Sensitivity*	0.744	0.782	0.744	0.936	0.962	**0.974**
Specificity*	0.731	0.744	0.859	0.885	0.949	**0.949**

* Sensitivity and Specificity are obtained with Youden's index

** Clinical variables = age, gender, and Karnofsky Performance Score (KPS)

Problem Statement:

Codeletion of 1p/19q chromosome arms is a strong predictor of tumor response to chemotherapy and radiotherapy in gliomas and associated with longer survival. However, determining 1p/19q status requires a surgical biopsy or surgery with inherent risks.

Our Approach:

By combining 4 ResNet-34 for each MR modalities, we predicted 1p/19q status non-invasively with accuracy of 94.9% and AUC of 98.6% on the test set.

Fig (A): Image pre-processing pipeline in our study.

Fig (B): In our modality network, a separate residual CNN was trained for each MR modality (input size of 3x142x142, i.e. 3 views with 142 by 142 pixel tumor patches). Then, we fed the sigmoid probabilities of each network into a logistic regression to predict the 1p/19q codeletion status.

Fig (C): ROC and a summary table for different MRI scan modalities. Combining 4 MRI modalities with age, gender, and Karnofsky Performance Score (KPS) resulted in the highest AUC and accuracy in the test set.