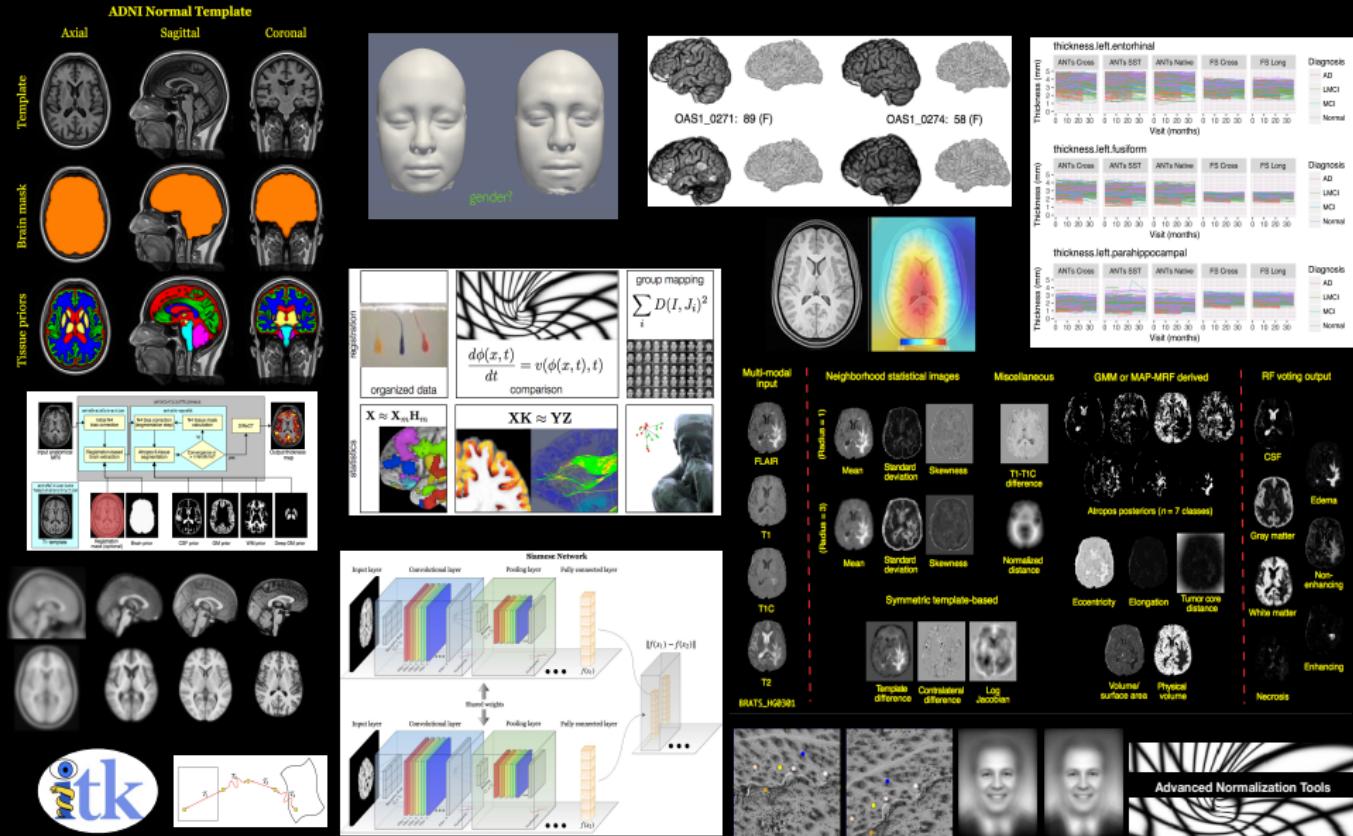


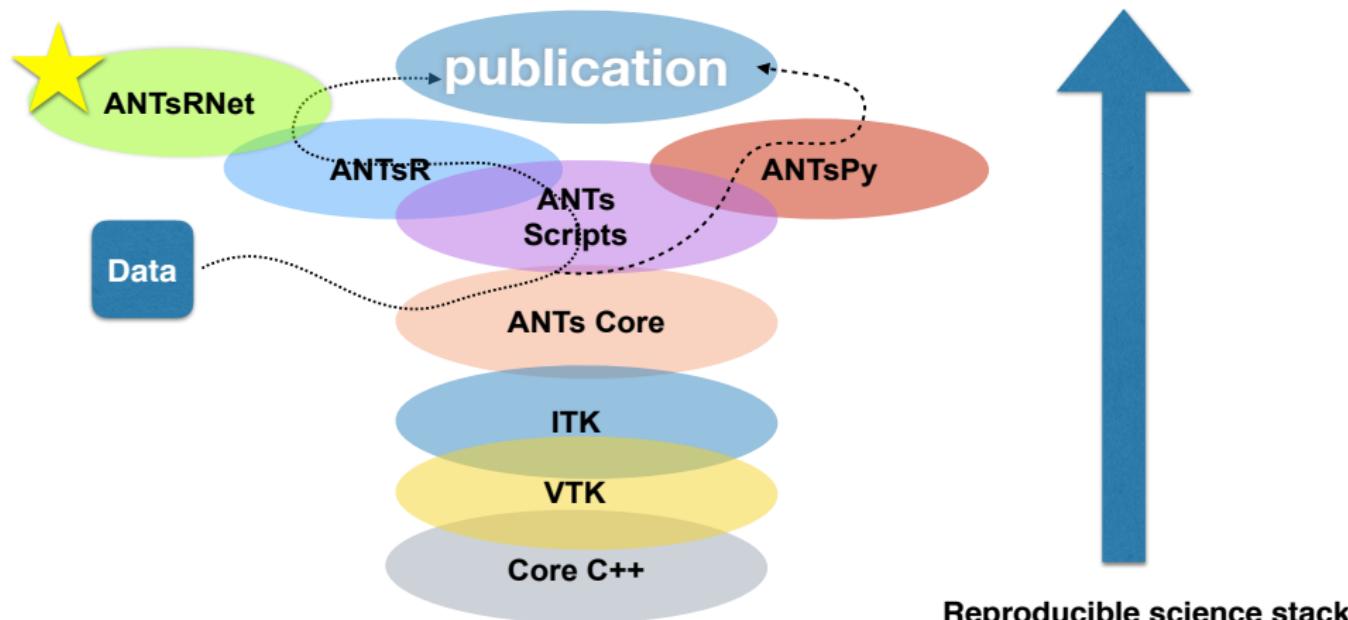
Longitudinal mapping of cortical thickness measures

The ANTs longitudinal cortical thickness pipeline

ANTs for large-scale neuroimage quantitative analysis

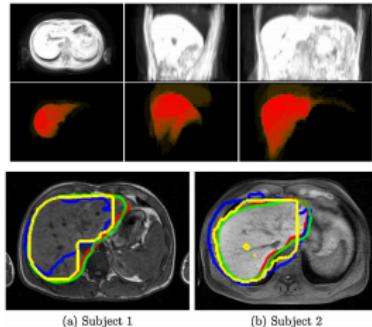


ANTsR & ANTsPy

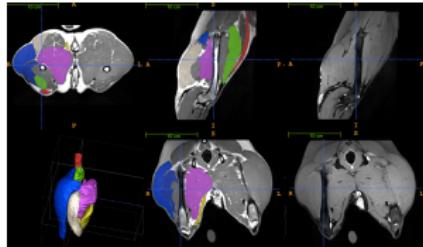


General purpose core

Liver registration/segmentation*

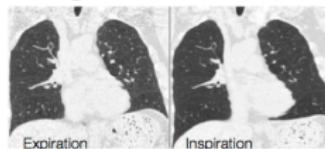


7,000+ multivariate registrations

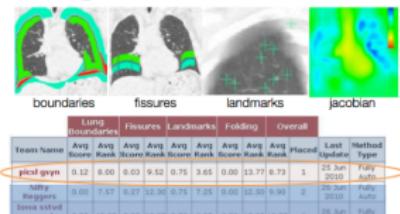


Multiple modality canine MRI: segmentation

Lung: EMPIRE 10 Challenge

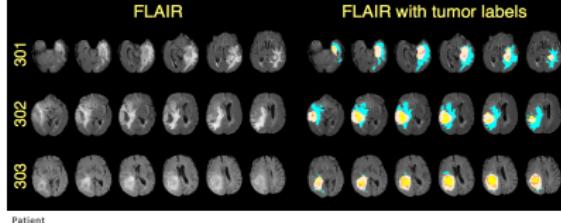


- Register pairs of thoracic CT volumes
- Part of MICCAI 2010 Grand Challenges: <http://empire10.uva.nl>
- First round offline competition finished on June 21, 2010
- ANTS by picard/gaynor : 1st place among 34 teams



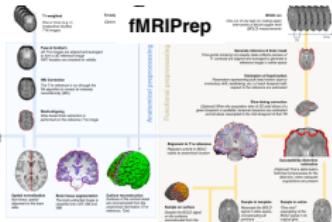
Brain tumor segmentation

BRATS 2013 challenge results



Position	User	Dice	Positive Predictive Value			Sensitivity	Kappa	Correlation Surface Rank	Tumor core Rank	Enhancing tumor Rank
			0.50	0.75	0.90					
1	Nick Tustison	0.89(1)	0.79	0.74(2)	0.65(2)	0.74	0.80(9)	0.89(2)	0.68	0.81(2)
		(2)					(2)	(2)		(2)
2	Reichardt Heiner	0.88(1)	0.79	0.80(2)	0.65(2)	0.79	0.71(3)	0.80(2)	0.63	0.79(2)
		(2)					(2)	(2)		(2)
3	Syed Naseer	0.86(2)	0.72	0.69(3)	0.61(4)	0.68	0.75(5)	0.88(2)	0.68	0.75(2)
		(2)					(2)	(2)		(2)
4	Liang Zhao	0.86(2)	0.70	0.69(3)	0.61(4)	0.67	0.80(6)	0.89(2)	0.79	0.76(2)
		(2)					(2)	(2)		(2)
5	Monica Cardoso	0.84(2)	0.69	0.69(3)	0.68(2)	0.68	0.80(5)	0.82	0.68	0.89(2)
		(2)					(2)	(2)		(2)
6	Jenna Reina	0.73(5)	0.68	0.67(4)	0.67(2)	0.77	0.79(2)	0.72(2)	0.66	0.76(2)
		(2)					(2)	(2)		(2)
7	Sezen Boyle	0.73(7)	0.66	0.62(3)	0.62(2)	0.66	0.80(7)	0.87(4)	0.68	0.75(2)
		(2)					(2)	(2)		(2)

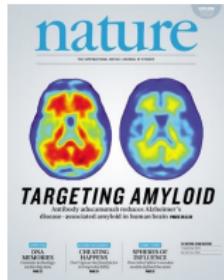
User base (industry and academia)



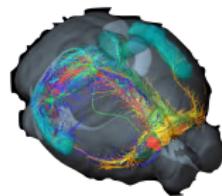
Stanford University



USC Laboratory
of Neuro Imaging



Princeton Neuroscience Institute



Google



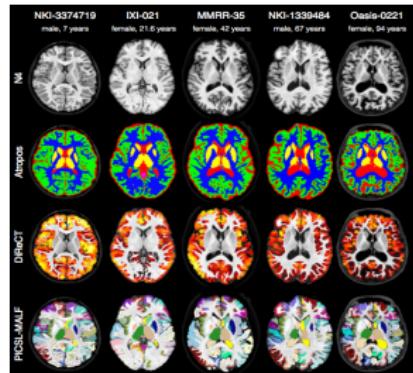
C-PAC



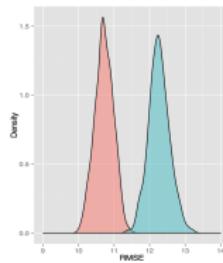
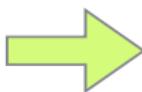
DiReCT: cortical thickness

DiReCT cortical thickness

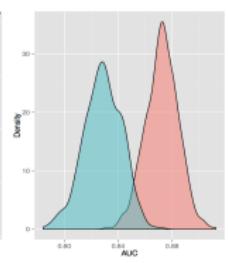
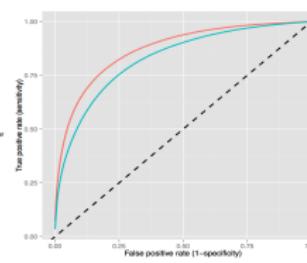
Column1	Column2
Tetris-playing ability	chronic pancreatitis
Huntington's disease	obsessive-compulsive disorder
schizophrenia	ADHD
bipolar disorder	obesity
Alzheimer's disease	heritable depression
frontotemporal dementia	elderly depression
Parkinson's disease	age
Williams syndrome	gender
multiple sclerosis	handedness
autism	intelligence
migraines	athletic ability
chronic smoking	meditative practices
alcoholism	musical ability
cocaine addiction	tendency toward criminality
Tourette syndrome in children	childhood sexual abuse in female adolescents
scoliosis in female adolescents	traumatic brain injury
early-onset blindness	untreated male-to-female transsexuality



How do we evaluate?



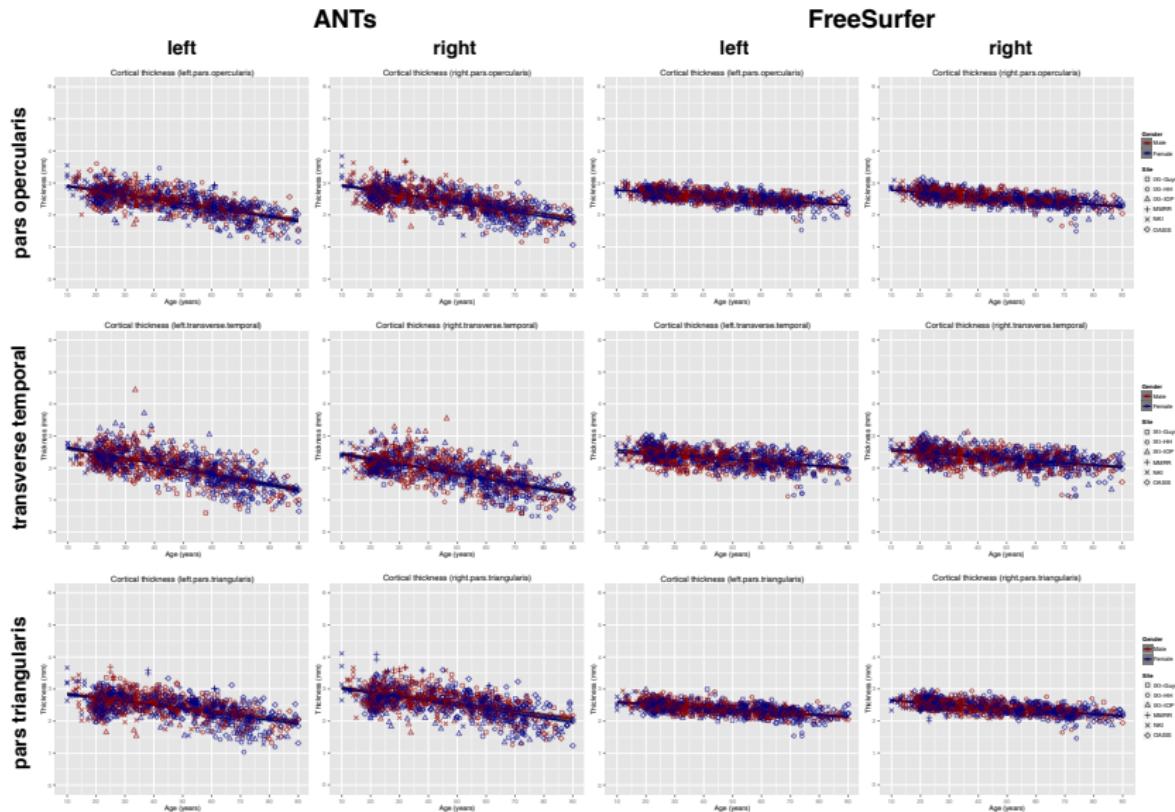
Repeatability:
 $ICC_{FS} = 0.97$, $ICC_{ANTs} = 0.98$



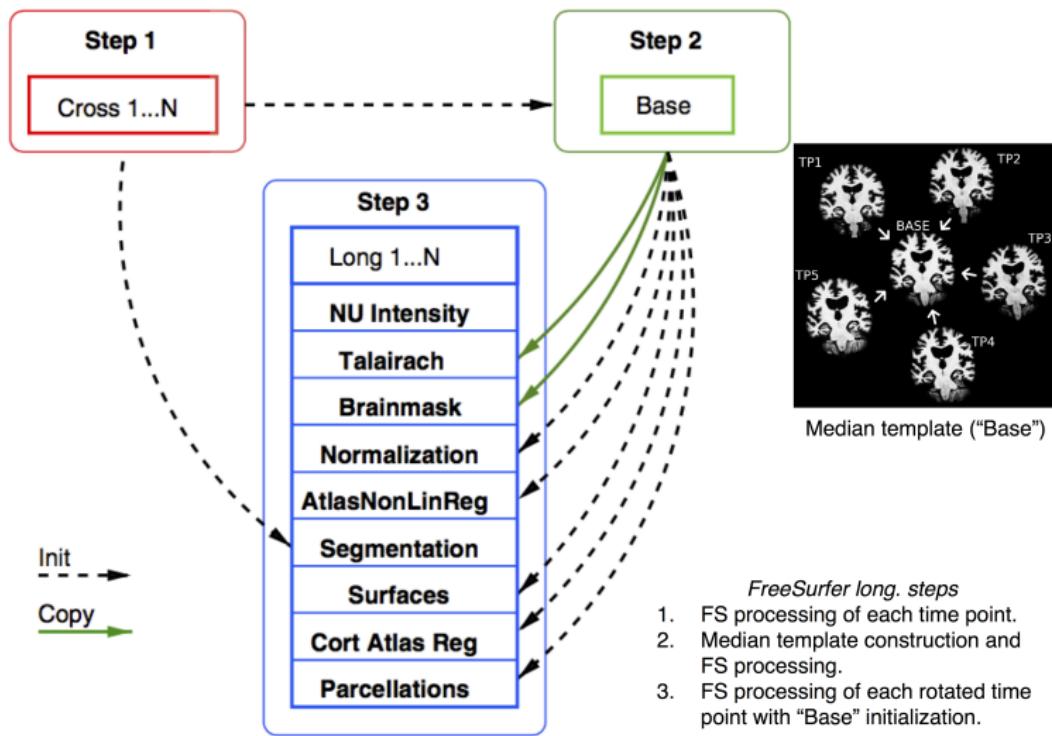
Gender

Large-Scale Evaluation of ANTs and FreeSurfer Cortical Thickness Measurements. NeuroImage, 2014.

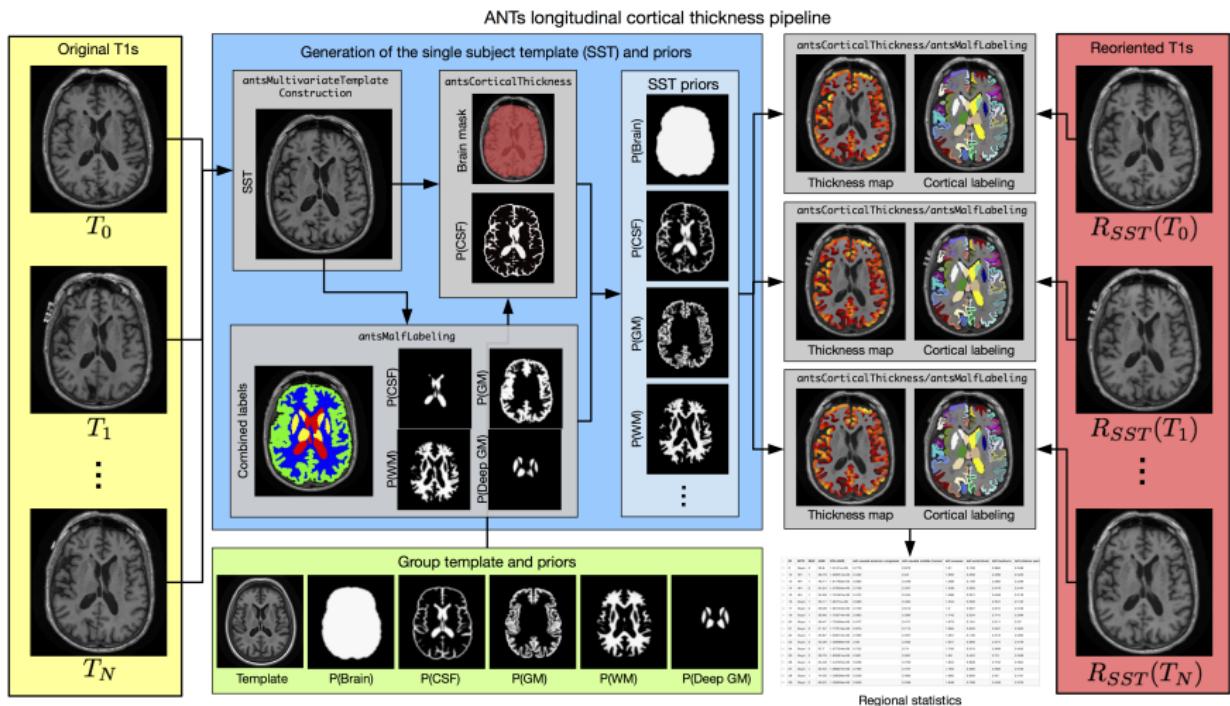
Cross-sectional comparison



FreeSurfer longitudinal pipeline



ANTs longitudinal pipeline



Evaluation?

After all this developmental effort¹:

- is all the extra longitudinal processing worth it? I.e., is it better than just processing everything through the cross-sectional pipeline?
- And, if so, do we process in native space or SST space?

Although ANTs processing has certain advantages (just as FreeSurfer has advantages),

- can we determine if the cortical thickness measures are somehow better than FreeSurfer's?
- And can we do it in a more general way than has been done previously?

¹first GitHub commit August 27, 2014