



brian avants <stnava@gmail.com>

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# Decision on your Manuscript

## #NEIN-D-11-00001

12 messages

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David N. Kennedy  
<david.kennedy@umassmed.edu>  
To: brian avants <stnava@gmail.com>

Tue, Jan 25, 2011 at  
3:19 PM

CC: [erik@tnb.ua.ac.be](mailto:erik@tnb.ua.ac.be), [ascoli@gmu.edu](mailto:ascoli@gmu.edu),  
[david.kennedy@umassmed.edu](mailto:david.kennedy@umassmed.edu)

Dear dr. avants:

Thank you for submitting "An Open-Source Multivariate Framework for n-Tissue Segmentation with Evaluation on Public Data" by dr. brian avants, nick tustison; jue wu; philip a cook; james c. gee to Neuroinformatics. Your manuscript has now been reviewed by two referees (comments appended below). They each agree that this is a valuable contribution, and provide a number of suggestions for further improvement and clarification.

Also, please note that Neuroinformatics now requires an 'Information Sharing Statement' to be included, immediately prior to the 'Acknowledgments'. The purpose of this statement is to disclose the practical sharing details for all articles. Examples include public data repositories and databases for structured data and models, websites for software distribution and database schemas, etc. (See the Editorial in Volume 2(4)). Please make an

explicit statement about if/how all resources utilized in this work can be accessed by the general public.

If you decide to resubmit the current version of the paper then please let me know and do so within 3 months from now. Your revision would be due on Apr 25, 2011.

In order to submit your revised manuscript electronically, please access the following web site:

<http://nein.edmgr.com/>

Your username is: stnava

Your password is: avants746424

Click "Author Login" to submit your revision.

Best regards,

David N. Kennedy, PhD  
Co-Editor-in-Chief, Neuroinformatics

#### COMMENTS FOR THE AUTHOR:

Reviewer #1: This paper summarised a semi-automatic segmentation tool called Atropos primarily targeting the brain. It uses EM based methods and can deal with a high number of labels. Overall it is well written, and the availability of the source code is great.

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pg27. Svn / svn -> SVN < be consistent >  
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buildtemplateparallel.sh . -> ants multitemplate labeling.sh and  
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**brian avants <stnava@gmail.com> Tue, Jan 25, 2011 at 6:46 PM**  
To: Nick Tustison <ntustison@gmail.com>

[Quoted text hidden]

---

**Nicholas Tustison Tue, Jan 25, 2011 at 7:02 PM**  
**<ntustison@gmail.com>**  
To: brian avants <stnava@gmail.com>

Wow, that was fast. Thanks for forwarding. The reviews seem quite reasonable. I'm sure you'll think about it in the near future so be sure to let me know how you would like to divide up the response tasks.

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**brian avants <stnava@gmail.com> Wed, Jan 26, 2011 at 12:12 AM**  
To: Nicholas Tustison <ntustison@gmail.com>

i think this is a useful point and easy(ish) to implement though a few ideas are possible ---- this is one thing that we could have the students (pauls class) work on to 'perfect' after we put something together:

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[Quoted text hidden]

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β®]Δπ

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**Nicholas Tustison**

**Wed, Jan 26, 2011 at 10:32**

**<ntustison@gmail.com>**

**AM**

To: brian avants <stnava@gmail.com>

Yeah, I don't think this is too bad. Obviously the equation in question is not difficult to implement, it's the actual interface and how to not make things too ugly. What I'm thinking is a new option where the label pairs can be specified, i.e.

--partial-voluming 1x2,1x3,2x3

For know we can restrict ourselves to the Gaussian case where I can create a partial-volume likelihood function which we should be able to plug right in.

[Quoted text hidden]

---

**Nicholas Tustison**

**Wed, Jan 26, 2011 at 12:42**

**<ntustison@gmail.com>**

**PM**

To: brian avants <stnava@gmail.com>

Hey Brian,

Regarding equation 26 in Shattuck 2001, which is what Noe and Gee referenced, they calculate the likelihood using a common  $\sigma$ . Since variances add algebraically, could we use a modified equation (26) where we replace the gaussian

$g(x_k; \alpha \mu_A + (1 - \alpha) \mu_B, \sigma)$

with

$g(x_k; \alpha \mu_A + (1-\alpha) \mu_B, \alpha \sigma_A^2 + (1-\alpha) \mu_B)$

and then solve the integral numerically?

Nick

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1208K

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**Nick Tustison**  
<ntustison@wustl.edu>

**Wed, Jan 26, 2011 at 1:03 PM**

To: brian avants <stnava@gmail.com>

never mind I figured it out

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> On Jan 26, 2011, at 12:12 AM, brian avants wrote:  
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**brian avants <stnava@gmail.com> Wed, Jan 26, 2011 at 1:37 PM**  
To: Nicholas Tustison <ntustison@gmail.com>

that's a very nice idea, nick. Alternatively could estimate the partial volume probabilities from the priors or current segmentation state. Eg every possible pair of labels. And would it not be part of the mrf?

On Jan 26, 2011 9:32 AM, "Nicholas Tustison"

<[ntustison@gmail.com](mailto:ntustison@gmail.com)> wrote:

---

**brian avants <[stnava@gmail.com](mailto:stnava@gmail.com)> Wed, Jan 26, 2011 at 1:47 PM**

To: Nick Tustison <[ntustison@wustl.edu](mailto:ntustison@wustl.edu)>

Just got last email and am back from wash u. Haven't read shattuck 2001 but intuitively thought mrf priors can be used for pv. Eg tabulate probabilities of label neighbor pairs and include in mrf term. Not sure of self to self probabilities though ... External fields used for this?

[Quoted text hidden]

---

**Nicholas Tustison**  
**<[ntustison@gmail.com](mailto:ntustison@gmail.com)>**

**Wed, Jan 26, 2011 at 3:02 PM**

To: brian avants <[stnava@gmail.com](mailto:stnava@gmail.com)>

Yes, that is right. Just like Noe and Gee accommodate distances in the mrf priors (like Shattuck), they also make a slight modification to the Potts model which we can easily do. So that gives us the prior term but we also need the likelihood model. I looked at Santago and Gage which is where Shattuck got the pv model and it makes sense. Essentially, all we need to do is get the pairwise means and variances and calculate the updated gaussian parameters for the pv model. By the way, Santago and Gage join the two separate variances in contrast to Shattuck. Seems pretty straightforward.

So, since I can't think of these things unless I think in terms of implementation, I'm thinking we inherit something like a PartialVolumeEstimateGaussianLikelihoodFunction from the

GaussianLikelihoodFunction. Each pairwise labeling that the user specifies with the --partial-volume option is assigned one of these likelihood functions. I think that would integrate well and then, in the future, we might want to incorporate other pv models.

Does that sound okay?

[Quoted text hidden]

---

**brian avants <stnava@gmail.com> Wed, Jan 26, 2011 at 3:13 PM**  
To: Nicholas Tustison <ntustison@gmail.com>

is requiring users to enumerate all pv pairs intuitive? in that, shouldnt all pairs be considered?

the pv neighborhood mrf model seems more natural to me than the pv likelihood model, though i see what you have in mind. am doubtful that it will help much and mixing the effects of both pv likelihood and pv mrf will make it difficult to ascertain the benefit of each independently.

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**Nicholas Tustison**  
**<ntustison@gmail.com>**  
To: brian avants <stnava@gmail.com>

**Wed, Jan 26, 2011 at 3:26 PM**

I can see providing an option to enumerate all pairings as they're spatially connected but it would seem that not all possible pairings from a set of labels should be considered. For 56 labels, that would be 1540 extra pv classes, correct?

And yes, the pv mrf accommodation does seem more intuitive than the pv likelihood model. I remember our earlier conversations and you being somewhat doubtful about the utility of incorporation of pv models. However, since all this is simply to appease the reviewers and perhaps getting some of the CIS537 students started, perhaps we can just go with a simple implementation for now, get the paper response out of the way, and then possibly return to this issue. I guess due to ease implementation is also why I favor the user specifying which labels to perform pv estimation.

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