# An Inspiring Title for the MELBA Journal Sample Article

Firstname1 **Name1** [1,3], Firstname2 Name2 [2,3]

**1** Melba journal, The Internet, CERN, CH
**2** Melba journal, The Internet, CERN, CH
**3** Melba journal, The Internet, CERN, CH

**Abstract**
We develop a learning framework for building deformable templates, which play a fundamental role in many image analysis and computational anatomy tasks. Conventional methods for template creation and image alignment to the template have undergone decades of rich technical development. In these frameworks, templates are constructed using an iterative process of template estimation and alignment, which is often computationally very expensive. Due in part to this shortcoming, most methods compute a single template for the entire population of images, or a few templates for specific sub-groups of the data. In this work, we present a probabilistic model and efficient learning strategy that yields either universal or *conditional* templates, jointly with a neural network that provides efficient alignment of the images to these templates. We demonstrate the usefulness of this method on a variety of domains, with a special focus on neuroimaging. This is particularly useful for clinical applications where a pre-existing template does not exist, or creating a new one with traditional methods can be prohibitively expensive. Our code is available at `http://yoururl.com`.

**Keywords**
Machine Learning, Image Registration

**Article informations**



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## 1. Introduction

A **deformable** *template* is an image that can be geometrically deformed to match images in a dataset, providing a common reference frame. Templates are a powerful tool that enables the analysis of geometric variability. They have been used in computer vision, medical image analysis, graphics, and time series signals.

## 2. Related Works

Spatial alignment, or registration, between two images is a building block for estimation of deformable templates. Alignment usually involves two steps: a global affine transformation, and a deformable transformation (as in many optical flow applications).

Use `\cite{}` for reference that is part of the sentence, and `\citep{}` for references in parenthesis. For example, Viola and Wells III (1997) is awesome. Also, this is a citation (Viola and Wells III, 1997).

## 3. Methods

### 3.1 Equations

We estimate the deformable template parameters $\theta_t$ and the deformation fields for every data point using maximum likelihood. Letting $\mathcal{V} = \{\boldsymbol{v}_i\}$ and $\mathcal{A} = \{a_i\}$,

$$\begin{aligned}\hat{\theta}_t, \hat{\mathcal{V}} &= \arg\max_{\theta_t, \mathcal{V}} \log p_{\theta_t}(\mathcal{V}|\mathcal{X}, \mathcal{A}) \\ &= \arg\max_{\theta_t, \mathcal{V}} \log p_{\theta_t}(\mathcal{X}|\mathcal{V}; \mathcal{A}) + \log p(\mathcal{V}), \qquad (1)\end{aligned}$$

where the first term captures the likelihood of the data and deformations, and the second term controls a prior over the deformation fields.

**Proof** Awesome proof. ■

### 3.2 Long equations in two columns

Note that equations can fill the width pretty quickly when there are two columns. Different mathemtical environments, beyond the basic `\begin{equation}` may be of use. Taking as an example the binomial formula which overflows in

Eq. (2):

$$(1+x)^n = \underbrace{(1+x)\times ... \times (1+x)}_{n \text{ times}} = \sum_{k=0}^{n} \binom{n}{k} x^k = \sum_{k=0}^{n} \frac{n!}{k!(n-k)!} x^k. \quad (2)$$

The `\begin{multline}` environment is an easy although crude fix:

$$\begin{aligned}(1+x)^n &= \underbrace{(1+x)\times ... \times (1+x)}_{n \text{ times}} \\ &= \sum_{k=0}^{n} \binom{n}{k} x^k \\ &= \sum_{k=0}^{n} \frac{n!}{k!(n-k)!} x^k. \end{aligned} \quad (3)$$

`\begin{align}` tends to give the most control over the final result:

$$\begin{aligned}(1+x)^n &= \underbrace{(1+x)\times ... \times (1+x)}_{n \text{ times}} \\ &= \sum_{k=0}^{n} \binom{n}{k} x^k \\ &= \sum_{k=0}^{n} \frac{n!}{k!(n-k)!} x^k. \end{aligned} \quad (4)$$

### 3.3 Math styles

Different font styles can be used for equations:

- `$a b c A B C 1 2 3$`: $abcABC123$
- `$\mathbf{a b c A B C 1 2 3}$`: $\mathbf{abcABC123}$
- `$\mathfrak{a b c A B C 1 2 3}$`: $\mathfrak{abcABC123}$
- `$\mathcal{ABC}$`: $\mathcal{ABC}$
- `$\mathbb{ABC}$`: $\mathbb{ABC}$
- `$\mathsf{ABC}$`: $\mathsf{ABC}$
- `$\mathtt{ABC}$`: $\mathtt{ABC}$

Text and names in equations should be dealt with the `\text` command, for instance:
`$\mathcal L_{\text{SuperLoss}}$`: $\mathcal{L}_{\text{SuperLoss}}$ and not $\mathcal{L}_{SuperLoss}$.

## 4. Section

### 4.1 Subsection

#### *4.1.1 Subsubsection*

**Paragraph** Ex culpa ut commodo proident esse excepteur mollit in sed aliqua fugiat sed cupidatat dolor sint quis veniam amet aute ea fugiat quis do excepteur sunt commodo magna cupidatat veniam minim anim mollit do enim et nostrud ad esse velit nisi est dolor do ut dolore excepteur nulla ex sunt exercitation consequat ullamco ad in fugiat ut ut enim adipisicing cillum nisi anim ullamco ullamco nisi esse aute dolore amet nisi adipisicing dolor dolore do ut aliqua in sunt aliqua tempor duis amet ut non adipisicing nostrud ex ullamco excepteur culpa anim est minim fugiat laborum ex irure consectetur eu in reprehenderit sint magna ut consequat laborum ex minim laboris culpa amet incididunt laborum laborum dolore nulla cupidatat dolore in aliqua ut eu in magna sunt eiusmod est labore sit eu incididunt fugiat in culpa pariatur voluptate duis id velit sunt reprehenderit pariatur amet esse dolore minim non fugiat fugiat amet incididunt commodo sit dolor.

In `itemize` and `enumeration`, longer sentences and text in paragraphs could require manual hyphenation with – in case of boxes under- or over-flows:

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## 5. Table and Figures

Table 1: By convention, Table caption goes on top.

| Left | center | right |
|---|---|---|
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| 444 | 555 | 666 |

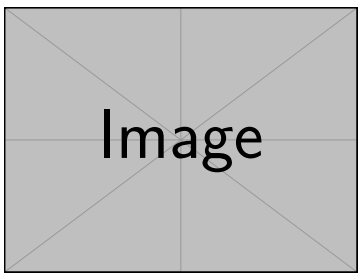


Figure 1: Example figure. Notice that the caption goes below.

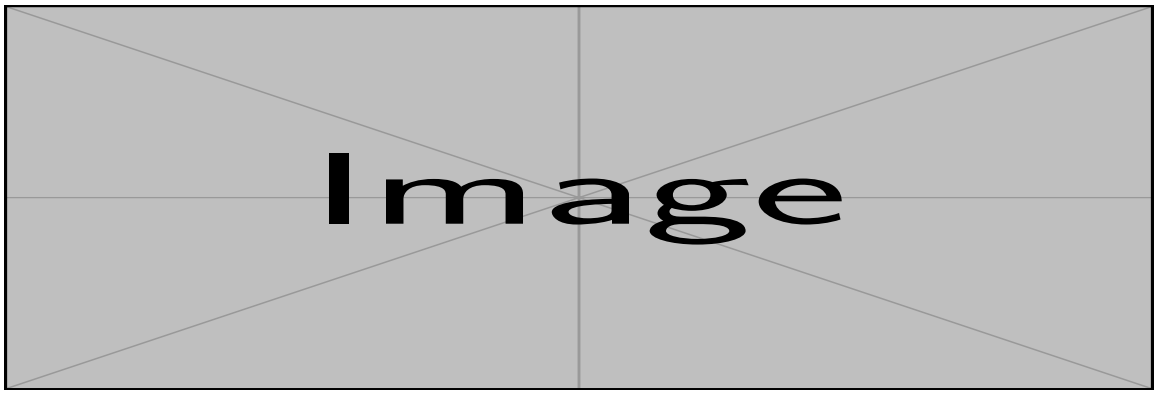


Figure 2: Example figure spanning the two columns.

## 6. Revision

We provide, in `melba.sty` a helpful command to color modifications after a revision: `\revision{}`. It is automatically de-activated for papers compiled with the `accepted`, `arxiv` or `specialissue` options.

### 6.1 It can also color whole sections and paragraphs

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## Acknowledgments

This work was supported by grants X, Y and Z. We also acknowledge important conversations with our colleagues A, B and C.

## Ethical Standards

The work follows appropriate ethical standards in conducting research and writing the manuscript, following all applicable laws and regulations regarding treatment of animals or human subjects.

## Conflicts of Interest

The conflicts of interest have not been entered yet.

## Data availability

Authors submitting articles to MELBA are required to include a Data Availability Statement in their manuscripts. The Data Availability Statement should clearly indicate whether the data supporting the findings of the study are available and, if so, how readers can access them. If the data are not available, authors should provide a brief justification for not sharing the data.

## References

Paul Viola and William M Wells III. Alignment by maximization of mutual information. *International journal of computer vision*, 24(2):137–154, 1997.

## Appendix A. Proof of the central theorem

In this appendix we prove the central theorem and present additional experimental results.
*Remainder omitted in this sample.*

## Appendix B. Appendix section

B.1 Appendix subsection

*B.1.1 Appendix subsubsection*

**Appendix paragraph** Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non proident, sunt in culpa qui officia deserunt mollit anim id est laborum.