LaTeX Made Easy with Overleaf!

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What is Overleaf?

Online resource for creating and maintaining LaTeX documents with lots of cool features.

- Real-time updates for document editor
- Dropbox capabilities
- Collaboration
- Github compatibility (new)

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Why Use Overleaf?

- Organized and user-friendly.
- Microsoft Word is easier, so it's better, right?
    - No.

Microsoft Word Version (very lame)

$$\lim \left[1 + \frac{a}{n} + o(n^{-1})\right]^n = e^a$$

LaTeX Version (very **awesome**!)

$$\lim_{n \to \infty} \left[1 + \frac{a}{n} + o\left(n^{-1}\right)\right]^n = e^a$$

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How to Use Overleaf

- Find a template you like → "Open a Copy"/"Rename"
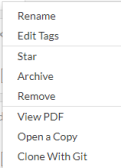
Collaboration with Github (Step #1)

- Use "Clone With Git" to get Overleaf Tex URL.
- Create repository from clone in Git client (SourceTree).
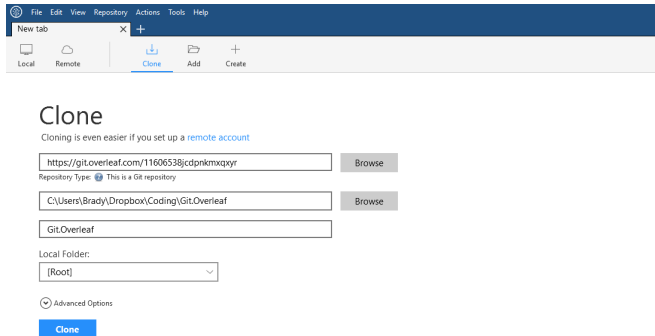
- Create new repository directly on GitHub.

Collaboration with Github (Step #3)

- In the Settings tab of your client (SourceTree) repository, add a new repository.
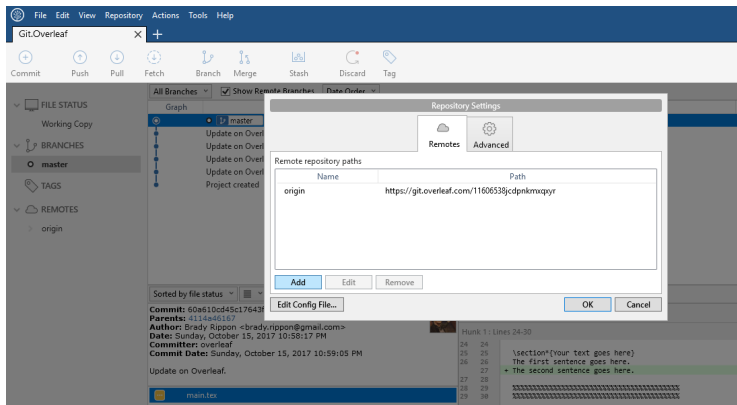
- Set new repository path as URL for GitHub repository.
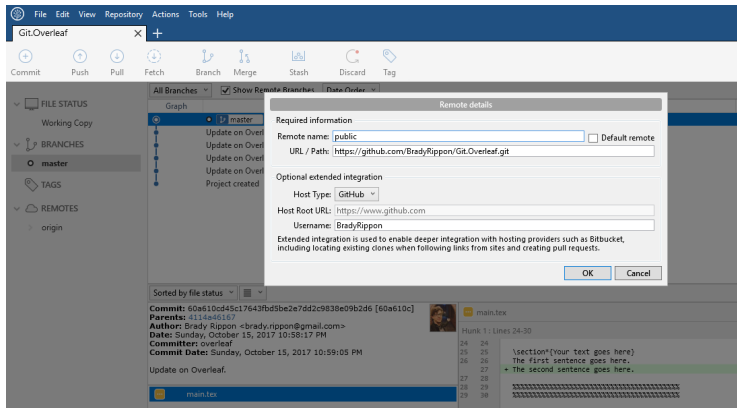
Collaboration with GitHub

Workflow
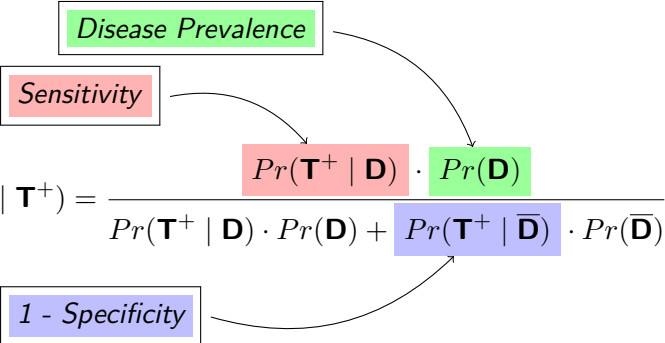
- Edit document directly on Overleaf.
- Pull changes from Overleaf repository from Git client (SourceTree).
- Push changes to shared GitHub repository.
- Pull collaborator changes from GitHub repository.

Note: Collaborators can now use local versions of LaTeX while you work online with Overleaf!

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Some Cool Examples of LaTeX!

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Colored Diagrams

Recall the equation for Bayes' Theorem:

$$Pr(\mathbf{D} \mid \mathbf{T}^+) = \frac{Pr(\mathbf{T}^+ \mid \mathbf{D}) \cdot Pr(\mathbf{D})}{Pr(\mathbf{T}^+ \mid \mathbf{D}) \cdot Pr(\mathbf{D}) + Pr(\mathbf{T}^+ \mid \overline{\mathbf{D}}) \cdot Pr(\overline{\mathbf{D}})}$$

Disease Prevalence

Sensitivity

1 - Specificity

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Fancy 2x2 Tables

A new study is investigating the effects of smoking on developing a cold. Researchers collect an appropriate sample and collected the following data:

	EXPOSURE		
DISEASE	Smoker $(+)$	Smoker $(-)$	
Cold	587	402	989
No Cold	2,743	2,578	5,321
	3,330	2,980	6,310

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Diagrams (One Sample Testing)

- The research is only testing **one sample** of subjects
- What data do we have?

We know σ

We only know s

$$z = \frac{\overline{x} - \mu_0}{\sigma/\sqrt{n}} \sim \mathsf{N}(0,1)$$

$$t = \frac{\overline{x} - \mu_0}{s/\sqrt{n}} \sim t_{n-1}$$

- Look up appropriate probabilities in **z-table** or **t-table**.
- Make a conclusion to your test that matches your results!

Diagrams (Two Sample Testing)

- The research is comparing **two samples** of subjects.

- What data do we have? $\boxed{\textit{May only know } s_1, s_2}$

$\boxed{\textit{We know } \sigma_1 \textit{ and } \sigma_2}$ $\boxed{\textit{Test: } \sigma_1 = \sigma_2}$ $\boxed{\textit{Test: } \sigma_1 \neq \sigma_2}$

$$z = \frac{\overline{x}_1 - \overline{x}_2}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$$

$$t = \frac{\overline{x}_1 - \overline{x}_2}{s_p\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}} \sim t_{n_1+n_2-2}$$

$$t = \frac{\overline{x}_1 - \overline{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} \sim t_{d''}$$

- **Note:** $s_p = \sqrt{\dfrac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}}$ and d'' is known

ANOVA (3+ Sample Testing)

Source	df	**SS**	**MS**
Treatment	$k-1$	$\displaystyle\sum_{i=1}^{k} n_i(\overline{x}_i - \overline{x})^2$	**SST** $/ (k-1)$
Error	$N-k$	$\displaystyle\sum_{i=1}^{k}\sum_{j=1}^{n_i}(x_{ij} - \overline{x}_i)^2$	**SSE** $/ (N-k)$
Total	$N-1$	$\displaystyle\sum_{i=1}^{k}\sum_{j=1}^{n_i}(x_{ij} - \overline{x})^2$	

$$F = \frac{\textbf{MST}}{\textbf{MSE}} \sim F_{k-1,N-k} \text{ under } \mathsf{H}_0$$

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ANOVA (3+ Sample Testing)

Relationship of ANOVA table entries

Source	df	**SS**	**MS**
Treatment	A	B	B / A
Error	C	D	D / C
Total	$A+C$	$B+D$	

Source	df	**SS**	**MS**
Treatment	A	B	B / A
Error	C	D	D / C
Total	$A+C$	$B+D$	

You can make presentations in LaTeX too!

(like this one!)

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But Wait, There's More (Again)!

LaTeX Cheat Sheet

- `https://www.overleaf.com/11628447zbwvtxvqbxbr#/43996246/`
  - (Lots of tips and tricks for writing LaTeX documents)

LaTeX Presentation Materials

- `https://www.overleaf.com/11628482ncxpqhdpbjnr#/43996388/`
  - (Coding for this presentation)
- `https://www.sharelatex.com/learn/Beamer`
  - (Beamer features, slide themes, color themes, etc.)