

Webservice User Guide

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Tutorials for user usage and Q&A sessions about web services.

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webservice overview

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If you have any advice or problems, feel free to leave comments under here or directly contact us.

Services

Our Service Portal :

<https://hub.mai.informatik.tu-darmstadt.de/>

Currently, we offer the following services to support our collaborative and organizational needs:

- Mattermost
Mattermost serves as the main communication platform, allowing teams to stay connected through chat channels and direct messages.
- Gitlab
GitLab is our centralized code management and version control tool. It also integrates with Mattermost for authentication, enabling seamless single sign-on and enhanced security
- Nextcloud
Nextcloud functions as our primary file storage and sharing solution, akin to Google Drive or Dropbox but self-hosted. It allows users to store, share, and collaboratively edit files.
- Bookstack
BookStack is a wiki-like platform tailored for organizing and documenting knowledge within the team. This tool is perfect for building a structured knowledge base, where team members can share tutorials, write guides, and document best practices.
- Keycloak
Keycloak provides unified identity and access management, allowing users to authenticate once and access multiple services within MAI group using a single set of credentials. It supplies mainly OIDC and SMAL authentication services.
- Ldap
LDAP (Lightweight Directory Access Protocol) is not visible to users. It acts as a backend directory service, supporting the authentication and management of user credentials across systems. It functions in conjunction with Keycloak and other applications.

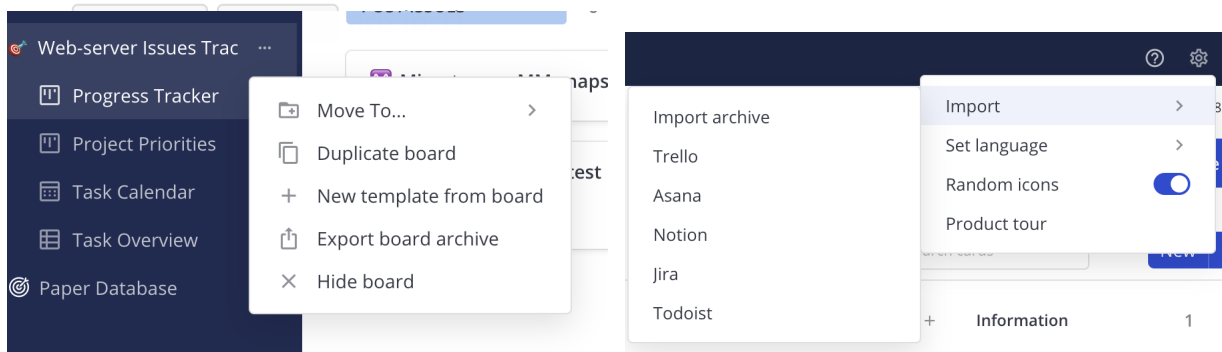
New user registration

1. Firstly you need to ask administrator to create a user for you, the following informations are needed:
 - username (note, not able to be changed anymore)
 - Email
 - Lab Postion
2. Once your account is created, you will receive the validation link in the corresponding Email.
You should update your password as well as profiles like last name, first name.
3. Once account is verified, you could go to keycloak management link [Link](#), there you could update your profile.

Mattermost user migration

We have migraed mattermost data from AIML to If you are already the user in AIML, you need to check if there is lost dialogs.

1. check your dialog and profile, your profile like nickname, profile photo are lost,
2. Known issues: `reactions in reply` is lost by migrating.
3. You need to manually migrate your focal board, just follow the following page, `export archive` (left page), `import archive` (right page). (unfortunately some info like `creation time`,



Wiki of web services

Author: Zhiyuan Date: 20.Oct.24

Nextcloud:

- Q: what's the quota of my account?

A: Currently, each user has a 500 GB quota. We may review and adjust this quota in the future based on demand.

- Q: Can I edit files locally on my machine?

A: Yes, you can download the Nextcloud desktop client from([link](#)), and use it similarly to other cloud storage services.

- Q: How can I share files with everyone in the lab?

A: There is a option is "Everyone" Group, you could Use the "Everyone" group to share files with all lab members. Additionally, you can place files in the `town-square` folder, which is visible to everyone.

- Q: How do I share files?

A: Click on a file to access the sharing options, which include:

- share with a group (recommended)
- share with a certain person on Nextcloud (recommended)
- share via link (not highly recommended since you could not well track the file change of external user)

- Q: Can I edit Office files(docx, pptx, etc) online in nextcloud?

A: Yes, currently we are using intergreated Collabora Office as backend. We are exploring additional options.

- Q: Can I use nextcloud as Zotero storage backend?

A: Yes, although there are some issues that we are addressing. We will update the user guide accordingly.

- Q: Will there be conflict while multiple people editing one file?

A: Generally, an editing lock is applied to files. If a file is being edited, it will be locked to prevent conflicts.

- Q: Is there size limation for uploading file?

A: Yes, currently you could upload files that is maximum 100G. However, best practice is to split big file to seperate files like `xxx.part1`, `xxx.part2`, `xxx.part3` to ensure best performance with nextcloud. Single file smaller than 5g or 10g is recommended. Example command would be

```
split -b 5g largefile output_prefix_
```

Bookstack

- Q: Can I share a book or page with a specific person?

A: No, you cannot, since bookstack's design philosophy is public wiki inside group. So you could only make the book visible to group but not certain person. If you would like a private page, you could alternatively use nextcloud.

- Q: Why the other people could seen my book?

A: By default the new book will be set as only visible to user itself. You should manually edit permission of book to let the group has permission to view group as following figure, here g_guest means students, hiwis, etc, and g_staff means staffs including wimis, professor, secrteriat.

Book Permissions

Set permissions here to override the default permissions provided by user roles.
Permissions set on books will automatically cascade to child chapters and pages, unless they have their own permissions defined.

Owner: hector garcia_rodrig...

g_guest User can view books & their content behind authentication	<input checked="" type="checkbox"/> View	<input checked="" type="checkbox"/> Create	<input checked="" type="checkbox"/> Update	<input type="checkbox"/> Delete	
g_staff User can edit Books, Chapters & Pages	<input checked="" type="checkbox"/> View	<input checked="" type="checkbox"/> Create	<input checked="" type="checkbox"/> Update	<input type="checkbox"/> Delete	
Override permissions for role <input type="text" value="Select"/>					
Everyone Else Set permissions for all roles not specifically overridden.	<input checked="" type="checkbox"/> Inherit defaults	<input type="checkbox"/> View	<input type="checkbox"/> Create	<input type="checkbox"/> Update	<input type="checkbox"/> Delete

- Q: Why I cannot edit/view my book after changing permission?

A: Contact admin to solve it. Be aware that your permission setting for specific group on certain book will also overwrite your ownership permission if you are member of that group.

- Q: How the groups are allocated now?

A: Currently there are four groups

- Admin: used for management.
- Staff: wimis, professors, etc... are included in this group.
Members could view/edit other people's book
- Guest: students, external collobarative phd/prof etc.
Members could only view/edit personal book.
- Public: anoymoous people without login, i.e. public page world wide.
- Secriteriat: secrteriat groups.

- Q: Can I add Latex formular in bookstack?

A: Inline math can be surrounded with $$ and math blocks can be surrounded with
$$$$
 or
$$$$
. Additionally LaTeX environments and
$$$$
 commands will be processed.

But:

- **No rendering in the Markdown live preview..**

- **No rendering in many export formats, including PDF**
- Q: Can I extend Markdown to support more features?
A: You could use html to extend markdown.

Mattermost

Our mattermost will be deployed as soon as possible.

- Q: Why am I unable to log in using Keycloak but have to login via Gitlab?
A: This a limitation of mattermost community version. For general SSO support, a commercial subscription is required. Using community version, we could only login via gitlab rather than keycloak.
- Q: Does mattermost via gitlab use the same credential with keycloak?
A: Yes, a single set of credentials works across all our services.
- Q: Is there a mobile app?
A: Yes, you could download via [this link](#).
- Q: Is there limitation for sending files via Mattermost?
A: Yes, the maximum file size is 50 MB.

Gitlab

- Q: Why doesn't Gitlab log in redirect to Keycloak?
A: Gitlab uses LDAP as backend for credential. Since it will serve as "overley" between our credential management and mattermost.
- Q: Can I set advanced featrues like CI/CD, gitlab pages, docker registry in gitlab?
A: CI/CD is enabled but not tested. gitlab pages and docker registry are not released yet. We could enable it if needed.
- Q: Can I use `git lfs` to store binary files?
A: Yes, but generally it's not recommended to very huge store binary files. The default limitation is `10 GB`.
- Q: How are the groups managed in gitlab?
A: Generally groups will be associated to academic project, users could create groups by user thmeselves for academic project like project `lecture slides`. Under groups could create repo(in gitlab is called "project") like "lecture1", "lecture2".
- Q: How the roles in gitlab are?
A: There are administrator, normal users, and external users. Wimis are normal users. Guests will be marked as `external`. Normal users could manage their own groups and projects, external users could not view/create/edit projects/groups except explictely authentication.

- Q: Shall I use ssh key for pull/push repo?

A: Yes, we plan to phase out username/password authentication for repository operations and require only SSH keys in the future.

Keycloak

- Q: Is there limitation for max failure login times?

A: Yes, maximum 10 times failed login. After that you could only successfully login 15mins later. Note: there will be no any information told you that your account is locked.

- Q: Why I entered true username and password but I still cannot login?

A: If you failed to log more than 10 times, your account will be locked in 15 minutes. You could tried later. (However, locked info will not be displayed in keycloak page, this is intentional to prevent username enumeration attacks).

- Q: Can I change my username?

A: No, you could not. That's used for identification by authentication across different applications.

- Q: What's the relationship of keycloak and LDAP?

A: LDAP and Keycloak function together as "user federation" services, with Keycloak providing OIDC and SAML authentication, and LDAP providing LDAP authentication.

- Q: Can I change my EMail?

A: Yes, and it's recommended to use TU's EMail.

- Q: Why does in Keycloak show that my password as Created January 1, 1970 at 12:59 AM.?

A: This is a known issue since user-federation with LDAP.

- Q: Can I change password or profiles directly in other webservises like mattermost?

A: No, You must change credentials in Keycloak.

- Q: Can new users directly register account?

A: No. In future we may consider an invitation based solution.

- Q: What will be different by different lab position?

A: Permissions and visibility vary; users like 'guests' and 'students' typically have limited permissions across different services.

Math macro command for latex support in markdown

Number and Arrays

command	visualization	comment	
<code>a</code>	a	A scalar	
<code>\va</code>	\va	A vector, additionally <code>\vzero</code> , <code>\vone</code> , <code>\vmu</code> , <code>\vnu</code> , <code>\vtheta</code> for <code>\vzero</code> , <code>\vone</code> , <code>\vmu</code> , <code>\vnu</code> , <code>\vtheta</code>	
<code>\mA</code>	\mA	A matrix	
<code>\tA</code>	\tA	A tensor	
<code>\mI_n</code>	\mI_n	Identity matrix with n rows and n columns	
<code>\mI</code>	\mI	Identity matrix with dimensionality implied by context	
<code>\ve^{(i)}</code>	$\ve^{(i)}$	Standard basis vector $[0,\dots,0,1,0,\dots,0]$ with a 1 at position i	
<code>\text{diag}(\va)</code>	$\text{diag}(\va)$	A square, diagonal matrix with diagonal entries given by \va	
<code>\ra</code>	\ra	A scalar-valued random variable	
<code>\rva</code>	\rva	A vector-valued random variables	
<code>\rmA</code>	\rmA	A matrix-valued random variabes	

Sets and Graphs

Command	Visualization	Comment
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<code>\sA</code>	$\$ \sA \$$	A set Note: the command covers <code>\sA</code> to <code>\sZ</code> but don't no <code>\sE</code> since it's expectation
<code>\R</code>	$\$ \R \$$	The set of real numbers
<code>{0, 1}</code>	$\$ \{0, 1\} \$$	The set containing 0 and 1
<code>{0, 1, \dots, n}</code>	$\$ \{0, 1, \dots, n\} \$$	The set of all integers between 0 and n
<code>[a, b]</code>	$\$ [a, b] \$$	The real interval including a and b
<code>(a, b]</code>	$\$ (a, b] \$$	The real interval excluding a but including b
<code>\sA \backslash \sB</code>	$\$ \sA \backslash \sB \$$	Set subtraction, i.e., the set containing the elements of \sA not in \sB
<code>\gG</code>	$\$ \gG \$$	A graph

Indexing

Command	Visualization	Comment
<code>\eva_i</code>	$\$ \eva_i \$$	Element i of vector \va , with indexing starting at 1
<code>\eva_{-i}</code>	$\$ \eva_{-i} \$$	All elements of vector \va except for element i
<code>\emA_{i,j}</code>	$\$ \emA_{i,j} \$$	Element i, j of matrix \mA
<code>\mA_{i, :}</code>	$\$ \mA_{i, :} \$$	Row i of matrix \mA
<code>\mA_{:, i}</code>	$\$ \mA_{:, i} \$$	Column i of matrix \mA
<code>\etA_{i, j, k}</code>	$\$ \etA_{i, j, k} \$$	Element (i, j, k) of a 3-D tensor \tA
<code>\tA_{:, :, i}</code>	$\$ \tA_{:, :, i} \$$	2-D slice of a 3-D tensor
<code>\erva_i</code>	$\$ \erva_i \$$	Element i of the random vector \rva

Linear Algebra Operators

Command	Visualization	Comment
<code>\mA^{\top}</code>	$\$ \mA^{\top} \$$	Transpose of matrix \mA

Command	Visualization	Comment
<code>\mA^+</code>	\mA^+	Moore-Penrose pseudoinverse of \mA
<code>\mA \odot \mB</code>	$\mA \odot \mB$	Element-wise (Hadamard) product of \mA and \mB
<code>\mathrm{det}(\mA)</code>	$\mathrm{det}(\mA)$	Determinant of \mA
<code>\sign(x)</code>	$\sign(x)$	Sign of a variable x
<code>\Tr \mA</code>	$\Tr(\mA)$	Trace of a matrix A

Calculus

Command	Visualization	Comment
<code>\diff y / \diff x</code>	$\diff y / \diff x$	Derivative of y with respect to x
<code>\frac{\partial y}{\partial x}</code>	$\frac{\partial y}{\partial x}$	Partial derivative of y with respect to x
<code>\nabla_{\vx} y</code>	$\nabla_{\vx} y$	Gradient of y with respect to \vx
<code>\nabla_{\mX} y</code>	$\nabla_{\mX} y$	Matrix derivatives of y with respect to \mX
<code>\nabla_{\tX} y</code>	$\nabla_{\tX} y$	Tensor containing derivatives of y with respect to \tX
<code>\frac{\partial f}{\partial \vx}</code>	$\frac{\partial f}{\partial \vx}$	Jacobian matrix $\mJ \in \mathbb{R}^{m \times n}$ of $f: \mathbb{R}^n \rightarrow \mathbb{R}^m$
<code>\nabla_{\vx}^2 f(\vx)\text{ or }\mH(f)(\vx)</code>	$\nabla_{\vx}^2 f(\vx)\text{ or }\mH(f)(\vx)$	The Hessian matrix of f at input point \vx
<code>\int f(\vx) \, d\vx</code>	$\int f(\vx) \, d\vx$	Definite integral over the entire domain of \vx
<code>\int_{\sS} f(\vx) \, d\vx</code>	$\int_{\sS} f(\vx) \, d\vx$	Definite integral with respect to \vx over the set \sS

Probabilities

Command	Visualization	Comment
<code>\ra \bot \rb</code>	$\ra \bot \rb$	The random variables \ra and \rb are independent
<code>\ra \bot \rb \mid \rc</code>	$\ra \bot \rb \mid \rc$	They are conditionally independent given \rc

Command	Visualization	Comment
<code>P(\ra)</code>	$\$P(\ra)\$$	A probability distribution over a discrete variable
<code>p(\ra)</code>	$\$p(\ra)\$$	A probability distribution over a continuous variable, or a variable of unspecified type
<code>\ra \sim P</code>	$\$\ra \sim P\$$	Random variable $\$\ra\$$ has distribution $\$P\$$
<code>\E_{\rx \sim P} [f(x)] \text{ or } \E f(x)</code>	$\$\E_{\rx \sim P} [f(x)] \text{ or } \E f(x)\$$	Expectation of $\$f(x)\$$ with respect to $\$P(\rx)\$$
<code>\Var(f(x))</code>	$\$\Var(f(x))\$$	Variance of $\$f(x)\$$ under $\$P(\rx)\$$
<code>\Cov(f(x), g(x))</code>	$\$\Cov(f(x), g(x))\$$	Covariance of $\$f(x)\$$ and $\$g(x)\$$ under $\$P(\rx)\$$
<code>H(\rx)</code>	$\$H(\rx)\$$	Shannon entropy of the random variable $\$\rx\$$
<code>\KL(P \Vert Q)</code>	$\$\KL(P \Vert Q)\$$	Kullback-Leibler divergence of $\$P\$$ and $\$Q\$$
<code>\mathcal{N}(\vx ; \vmu , \mSigma)</code>	$\$\mathcal{N}(\vx ; \vmu , \mSigma)\$$	Gaussian distribution over $\$\vx\$$ with mean $\$\vmu\$$ and covariance $\$\mSigma\$$

Functions

Command	Visualization	Comment
<code>f: \sA \rightarrow \sB</code>	$\$f: \sA \rightarrow \sB\$$	The function $\$f\$$ with domain $\$\sA\$$ and range $\$\sB\$$
<code>f \circ g</code>	$\$f \circ g\$$	Composition of the functions $\$f\$$ and $\$g\$$
<code>f(\vx ; \vtheta)</code>	$\$f(\vx ; \vtheta)\$$	A function of $\$\vx\$$ parametrized by $\$\vtheta\$$. Sometimes written as $\$f(\vx)\$$ to simplify notation
<code>\log x</code>	$\$\log x\$$	Natural logarithm of $\$x\$$
<code>\sigma(x)</code>	$\$\sigma(x)\$$	Logistic sigmoid, $\displaystyle \frac{1}{1 + \exp(-x)}$
<code>\zeta(x)</code>	$\$\zeta(x)\$$	Softplus, $\$\log(1 + \exp(x))\$$
<code>\Vert \vx \Vert_p</code>	$\$\Vert \vx \Vert_p\$$	$\$L^p\$$ norm of $\$\vx\$$
<code>\Vert \vx \Vert</code>	$\$\Vert \vx \Vert\$$	$\$L^2\$$ norm of $\$\vx\$$
<code>x^+</code>	$\$x^+\$$	Positive part of $\$x\$$, i.e., $\$\max(0,x)\$$

Command	Visualization	Comment
<code>\bm{1}_\mathrm{condition}</code>	$\bm{1}_\mathrm{condition}$	Is 1 if the condition is true, 0 otherwise

Custom Commands special

Command	Visualization	Comment
<code>\bm{#1}</code>	\bm{x}	Bold symbol, e.g., \boldsymbol{x}
<code>\sign</code>	sign	operator , Sign , sign
<code>\Tr</code>	Tr	operator Trace, Tr
<code>\E</code>	\mathbb{E}	Expectation, \mathbb{E}
<code>\KL</code>	KL	Kullback-Leibler divergence, D_KL
<code>\NormalDist</code>	NormalDist	Gaussian distribution, \mathcal{N}
<code>\diag</code>	diag	Diagonal matrix, diag
<code>\Ls</code>	\mathcal{L}	Loss function, \mathcal{L}
<code>\R</code>	\mathbb{R}	Real number set, \mathbb{R}
<code>\emp</code>	\tilde{p}	Empirical distribution, \tilde{p}
<code>\lr</code>	α	Learning rate, α
<code>\reg</code>	λ	Regularization coefficient, λ
<code>\rect</code>	rectifier	Rectifier activation, $\mathrm{rectifier}$
<code>\softmax</code>	softmax	Softmax function, $\mathrm{softmax}$
<code>\sigmoid</code>	σ	Sigmoid function, σ
<code>\softplus</code>	ζ	Softplus function, ζ
<code>\Var</code>	Var	Variance, Var
<code>\standarderror</code>	SE	Standard error, SE
<code>\Cov</code>	Cov	Covariance, Cov
<code>\tran</code>	$^\text{top}$	Transpose operator, $^\text{top}$
<code>\inv</code>	$^{-1}$	Inverse operator, $^{-1}$
<code>\diff</code>	d	Differential operator, d

Reference

- Ian Goodfellow's ML book:
https://github.com/goodfeli/dlbook_notation/blob/master/notation_example.pdf
- MathJax: <https://docs.mathjax.org/en/latest/input/tex/macros.html>

Markdown Math Macro definition

The latex command source

Click to unfold latex macro definition

Latex command definition source

```
\newcommand{\bm}[1]{\boldsymbol{#1}}

\newcommand{\sign}{\operatorname{sign}} % \DeclareMathOperator{\sign}{sign}
\newcommand{\Tr}{\operatorname{Tr}} % \DeclareMathOperator{\Tr}{Tr}


\newcommand{\E}{\mathbb{E}}
\newcommand{\KL}{D_{\mathrm{KL}}}
\newcommand{\NormalDist}{\mathcal{N}}
\newcommand{\diag}{\mathrm{diag}}


\newcommand{\Ls}{\mathcal{L}}
\newcommand{\R}{\mathbb{R}}
\newcommand{\emp}{\tilde{p}}
\newcommand{\lr}{\alpha}
\newcommand{\reg}{\lambda}
\newcommand{\rect}{\mathrm{rectifier}}
\newcommand{\softmax}{\mathrm{softmax}}
\newcommand{\sigmoid}{\sigma}
\newcommand{\softplus}{\zeta}
\newcommand{\Var}{\mathrm{Var}}
\newcommand{\standarderror}{\mathrm{SE}}
\newcommand{\Cov}{\mathrm{Cov}}
\newcommand{\tran}{^{\mathrm{top}}}
```

```
\newcommand{\inv}{^{\scriptstyle -1}}
\newcommand{\diff}{\mathrm{d}}
```

% % Vectors

```
\newcommand{\vzero}{\bm{0}}
\newcommand{\vone}{\bm{1}}
\newcommand{\vmu}{\bm{\mu}}
\newcommand{\vnu}{\bm{\nu}}
\newcommand{\vtheta}{\bm{\theta}}
```

```
\renewcommand{\va}{\bm{a}}
\renewcommand{\vb}{\bm{b}}
% \newcommand{\va}{\bm{a}}
% \newcommand{\vb}{\bm{b}}
\newcommand{\vc}{\bm{c}}
\newcommand{\vd}{\bm{d}}
\newcommand{\ve}{\bm{e}}
\newcommand{\vf}{\bm{f}}
\newcommand{\vg}{\bm{g}}
\newcommand{\vh}{\bm{h}}
\newcommand{\vi}{\bm{i}}
\newcommand{\vj}{\bm{j}}
\newcommand{\vk}{\bm{k}}
\newcommand{\vl}{\bm{l}}
\newcommand{\vm}{\bm{m}}
\newcommand{\vn}{\bm{n}}
\newcommand{\vo}{\bm{o}}
\newcommand{\vp}{\bm{p}}
\newcommand{\vq}{\bm{q}}
\newcommand{\vr}{\bm{r}}
\newcommand{\vs}{\bm{s}}
\newcommand{\vt}{\bm{t}}
\newcommand{\vu}{\bm{u}}
\newcommand{\vv}{\bm{v}}
\newcommand{\vw}{\bm{w}}
\newcommand{\vx}{\bm{x}}
\newcommand{\vy}{\bm{y}}
\newcommand{\vz}{\bm{z}}
```

```

% % Random variables
% % old latex command \rm is overwritten, now should use ``\textrm`` or ``\mathrm``
% \newcommand{\reta}{\textnormal{$\eta$}}
\newcommand{\ra}{\textnormal{a}}
\newcommand{\rb}{\textnormal{b}}
\newcommand{\rc}{\textnormal{c}}
\newcommand{\rd}{\textnormal{d}}
\newcommand{\re}{\textnormal{e}}
\newcommand{\rf}{\textnormal{f}}
\newcommand{\rg}{\textnormal{g}}
\newcommand{\rh}{\textnormal{h}}
\newcommand{\ri}{\textnormal{i}}
\newcommand{\rj}{\textnormal{j}}
\newcommand{\rk}{\textnormal{k}}
\newcommand{\rl}{\textnormal{l}}
\renewcommand{\rm}{\textnormal{m}} % note \rm is old command
\newcommand{\rn}{\textnormal{n}}
\newcommand{\ro}{\textnormal{o}}
\newcommand{\rp}{\textnormal{p}}
\newcommand{\rq}{\textnormal{q}}
\newcommand{\rr}{\textnormal{r}}
\newcommand{\rs}{\textnormal{s}}
\newcommand{\rt}{\textnormal{t}}
\newcommand{\ru}{\textnormal{u}}
\newcommand{\rv}{\textnormal{v}}
\newcommand{\rw}{\textnormal{w}}
\newcommand{\rx}{\textnormal{x}}
\newcommand{\ry}{\textnormal{y}}
\newcommand{\rz}{\textnormal{z}}

```

```

% % Random vectors % TODO, greek vector valued random variables and vectors are same
\newcommand{\rvepsilon}{\bm{\epsilon}}
\newcommand{\rvtheta}{\bm{\theta}}
\newcommand{\rva}{\mathbf{a}}
\newcommand{\rvb}{\mathbf{b}}
\newcommand{\rvc}{\mathbf{c}}

```



```

\newcommand{\rvd}{\mathbf{d}}
\newcommand{\rve}{\mathbf{e}}
\newcommand{\rvf}{\mathbf{f}}
\newcommand{\rvg}{\mathbf{g}}
\newcommand{\rvh}{\mathbf{h}}
\newcommand{\rvi}{\mathbf{i}}
\newcommand{\rvj}{\mathbf{j}}
\newcommand{\rvk}{\mathbf{k}}
\newcommand{\rvl}{\mathbf{l}}
\newcommand{\rvm}{\mathbf{m}}
\newcommand{\rvn}{\mathbf{n}}
\newcommand{\rvo}{\mathbf{o}}
\newcommand{\rvp}{\mathbf{p}}
\newcommand{\rvq}{\mathbf{q}}
\newcommand{\rvr}{\mathbf{r}}
\newcommand{\rvs}{\mathbf{s}}
\newcommand{\rvt}{\mathbf{t}}
\newcommand{\rvu}{\mathbf{u}}
\newcommand{\rvv}{\mathbf{v}}
\newcommand{\rvw}{\mathbf{w}}
\newcommand{\rvx}{\mathbf{x}}
\newcommand{\rvy}{\mathbf{y}}
\newcommand{\rvz}{\mathbf{z}}

% % Elements of random vectors
\newcommand{\erv a}{\{\textnormal{a}\}}
\newcommand{\erv b}{\{\textnormal{b}\}}
\newcommand{\erv c}{\{\textnormal{c}\}}
\newcommand{\erv d}{\{\textnormal{d}\}}
\newcommand{\erv e}{\{\textnormal{e}\}}
\newcommand{\erv f}{\{\textnormal{f}\}}
\newcommand{\erv g}{\{\textnormal{g}\}}
\newcommand{\erv h}{\{\textnormal{h}\}}
\newcommand{\erv i}{\{\textnormal{i}\}}
\newcommand{\erv j}{\{\textnormal{j}\}}
\newcommand{\erv k}{\{\textnormal{k}\}}
\newcommand{\erv l}{\{\textnormal{l}\}}
\newcommand{\erv m}{\{\textnormal{m}\}}

```

```

\newcommand{\ervn}{\textnormal{n}}
\newcommand{\ervo}{\textnormal{o}}
\newcommand{\ervp}{\textnormal{p}}
\newcommand{\ervq}{\textnormal{q}}
\newcommand{\ervr}{\textnormal{r}}
\newcommand{\ervs}{\textnormal{s}}
\newcommand{\ervt}{\textnormal{t}}
\newcommand{\ervu}{\textnormal{u}}
\newcommand{\ervv}{\textnormal{v}}
\newcommand{\ervw}{\textnormal{w}}
\newcommand{\ervx}{\textnormal{x}}
\newcommand{\ervy}{\textnormal{y}}
\newcommand{\ervz}{\textnormal{z}}

```

% % Random matrices

```

\newcommand{\rmA}{\mathbf{A}}
\newcommand{\rmB}{\mathbf{B}}
\newcommand{\rmC}{\mathbf{C}}
\newcommand{\rmD}{\mathbf{D}}
\newcommand{\rmE}{\mathbf{E}}
\newcommand{\rmF}{\mathbf{F}}
\newcommand{\rmG}{\mathbf{G}}
\newcommand{\rmH}{\mathbf{H}}
\newcommand{\rmI}{\mathbf{I}}
\newcommand{\rmJ}{\mathbf{J}}
\newcommand{\rmK}{\mathbf{K}}
\newcommand{\rmL}{\mathbf{L}}
\newcommand{\rmM}{\mathbf{M}}
\newcommand{\rmN}{\mathbf{N}}
\newcommand{\rmO}{\mathbf{O}}
\newcommand{\rmP}{\mathbf{P}}
\newcommand{\rmQ}{\mathbf{Q}}
\newcommand{\rmR}{\mathbf{R}}
\newcommand{\rmS}{\mathbf{S}}
\newcommand{\rmT}{\mathbf{T}}
\newcommand{\rmU}{\mathbf{U}}
\newcommand{\rmV}{\mathbf{V}}
\newcommand{\rmW}{\mathbf{W}}

```

```
\newcommand{\rmX}{\{\mathbf{X}\}}
```

```
\newcommand{\rmY}{\{\mathbf{Y}\}}
```

```
\newcommand{\rmZ}{\{\mathbf{Z}\}}
```

```
% % Elements of random matrices
```

```
\newcommand{\ermA}{\{\textnormal{A}\}}
```

```
\newcommand{\ermB}{\{\textnormal{B}\}}
```

```
\newcommand{\ermC}{\{\textnormal{C}\}}
```

```
\newcommand{\ermD}{\{\textnormal{D}\}}
```

```
\newcommand{\ermE}{\{\textnormal{E}\}}
```

```
\newcommand{\ermF}{\{\textnormal{F}\}}
```

```
\newcommand{\ermG}{\{\textnormal{G}\}}
```

```
\newcommand{\ermH}{\{\textnormal{H}\}}
```

```
\newcommand{\ermI}{\{\textnormal{I}\}}
```

```
\newcommand{\ermJ}{\{\textnormal{J}\}}
```

```
\newcommand{\ermK}{\{\textnormal{K}\}}
```

```
\newcommand{\ermL}{\{\textnormal{L}\}}
```

```
\newcommand{\ermM}{\{\textnormal{M}\}}
```

```
\newcommand{\ermN}{\{\textnormal{N}\}}
```

```
\newcommand{\ermO}{\{\textnormal{O}\}}
```

```
\newcommand{\ermP}{\{\textnormal{P}\}}
```

```
\newcommand{\ermQ}{\{\textnormal{Q}\}}
```

```
\newcommand{\ermR}{\{\textnormal{R}\}}
```

```
\newcommand{\ermS}{\{\textnormal{S}\}}
```

```
\newcommand{\ermT}{\{\textnormal{T}\}}
```

```
\newcommand{\ermU}{\{\textnormal{U}\}}
```

```
\newcommand{\ermV}{\{\textnormal{V}\}}
```

```
\newcommand{\ermW}{\{\textnormal{W}\}}
```

```
\newcommand{\ermX}{\{\textnormal{X}\}}
```

```
\newcommand{\ermY}{\{\textnormal{Y}\}}
```

```
\newcommand{\ermZ}{\{\textnormal{Z}\}}
```

```
% % Elements of vectors
```

```
\newcommand{\evalpha}{\{\alpha\}}
```

```
\newcommand{\evbeta}{\{\beta\}}
```

```
\newcommand{\vepsilon}{\{\epsilon\}}
```

```

\newcommand{\evlambda}{\{\lambda\}}
\newcommand{\evomega}{\{\omega\}}
\newcommand{\evmu}{\{\mu\}}
\newcommand{\evpsi}{\{\psi\}}
\newcommand{\evsigma}{\{\sigma\}}
\newcommand{\evtheta}{\{\theta\}}

```

```

\newcommand{\eva}{\{a\}}
\newcommand{\evb}{\{b\}}
\newcommand{\evc}{\{c\}}
\newcommand{\evd}{\{d\}}
\newcommand{\eve}{\{e\}}
\newcommand{\evf}{\{f\}}
\newcommand{\evg}{\{g\}}
\newcommand{\evh}{\{h\}}
\newcommand{\evi}{\{i\}}
\newcommand{\evj}{\{j\}}
\newcommand{\evk}{\{k\}}
\newcommand{\evl}{\{l\}}
\newcommand{\evm}{\{m\}}
\newcommand{\evn}{\{n\}}
\newcommand{\evo}{\{o\}}
\newcommand{\evp}{\{p\}}
\newcommand{\evq}{\{q\}}
\newcommand{\evr}{\{r\}}
\newcommand{\evs}{\{s\}}
\newcommand{\evt}{\{t\}}
\newcommand{\evu}{\{u\}}
\newcommand{\evv}{\{v\}}
\newcommand{\evw}{\{w\}}
\newcommand{\evx}{\{x\}}
\newcommand{\evy}{\{y\}}
\newcommand{\evz}{\{z\}}

```

```

% %% Matrix

```

```

\newcommand{\mBeta}{\{\bm{\beta}\}}
\newcommand{\mPhi}{\{\bm{\Phi}\}}
\newcommand{\mLambda}{\{\bm{\Lambda}\}}

```

```
\newcommand{\mSigma}{\bm{\Sigma}}
```

```
\newcommand{\mA}{\bm{A}}
```

```
\newcommand{\mB}{\bm{B}}
```

```
\newcommand{\mC}{\bm{C}}
```

```
\newcommand{\mD}{\bm{D}}
```

```
\newcommand{\mE}{\bm{E}}
```

```
\newcommand{\mF}{\bm{F}}
```

```
\newcommand{\mG}{\bm{G}}
```

```
\newcommand{\mH}{\bm{H}}
```

```
\newcommand{\mI}{\bm{I}}
```

```
\newcommand{\mJ}{\bm{J}}
```

```
\newcommand{\mK}{\bm{K}}
```

```
\newcommand{\mL}{\bm{L}}
```

```
\newcommand{\mM}{\bm{M}}
```

```
\newcommand{\mN}{\bm{N}}
```

```
\newcommand{\mO}{\bm{O}}
```

```
\newcommand{\mP}{\bm{P}}
```

```
\newcommand{\mQ}{\bm{Q}}
```

```
\newcommand{\mR}{\bm{R}}
```

```
\newcommand{\mS}{\bm{S}}
```

```
\newcommand{\mT}{\bm{T}}
```

```
\newcommand{\mU}{\bm{U}}
```

```
\newcommand{\mV}{\bm{V}}
```

```
\newcommand{\mW}{\bm{W}}
```

```
\newcommand{\mX}{\bm{X}}
```

```
\newcommand{\mY}{\bm{Y}}
```

```
\newcommand{\mZ}{\bm{Z}}
```

```
% \DeclareMathAlphabet{\mathsf}{\encodingdefault}{\sfdefault}{m}{sl}
```

```
% \SetMathAlphabet{\mathsf}{bold}{\encodingdefault}{\sfdefault}{bx}{n}
```

```
% \newcommand{\tens}[1]{\bm{\mathsf{#1}}}
```

```
% in mathjax use mathsf insteadly
```

```
\newcommand{\tens}[1]{\bm{\mathit{\mathsf{#1}}}}
```

```
% % Tensor
```

```
\newcommand{\tA}{\tens{A}}
```

```
\newcommand{\tB}{\tens{B}}
```

```

\newcommand{\tC}{\{\tens{C}\}}
\newcommand{\tD}{\{\tens{D}\}}
\newcommand{\tE}{\{\tens{E}\}}
\newcommand{\tF}{\{\tens{F}\}}
\newcommand{\tG}{\{\tens{G}\}}
\newcommand{\tH}{\{\tens{H}\}}
\newcommand{\tI}{\{\tens{I}\}}
\newcommand{\tJ}{\{\tens{J}\}}
\newcommand{\tK}{\{\tens{K}\}}
\newcommand{\tL}{\{\tens{L}\}}
\newcommand{\tM}{\{\tens{M}\}}
\newcommand{\tN}{\{\tens{N}\}}
\newcommand{\tO}{\{\tens{O}\}}
\newcommand{\tP}{\{\tens{P}\}}
\newcommand{\tQ}{\{\tens{Q}\}}
\newcommand{\tR}{\{\tens{R}\}}
\newcommand{\tS}{\{\tens{S}\}}
\newcommand{\tT}{\{\tens{T}\}}
\newcommand{\tU}{\{\tens{U}\}}
\newcommand{\tV}{\{\tens{V}\}}
\newcommand{\tW}{\{\tens{W}\}}
\newcommand{\tX}{\{\tens{X}\}}
\newcommand{\tY}{\{\tens{Y}\}}
\newcommand{\tZ}{\{\tens{Z}\}}

```

% % Graph

```

\newcommand{\gA}{\{\mathcal{A}\}}
\newcommand{\gB}{\{\mathcal{B}\}}
\newcommand{\gC}{\{\mathcal{C}\}}
\newcommand{\gD}{\{\mathcal{D}\}}
\newcommand{\gE}{\{\mathcal{E}\}}
\newcommand{\gF}{\{\mathcal{F}\}}
\newcommand{\gG}{\{\mathcal{G}\}}
\newcommand{\gH}{\{\mathcal{H}\}}
\newcommand{\gI}{\{\mathcal{I}\}}
\newcommand{\gJ}{\{\mathcal{J}\}}
\newcommand{\gK}{\{\mathcal{K}\}}

```

```

\newcommand{\gL}{\{\mathcal{L}\}}
\newcommand{\gM}{\{\mathcal{M}\}}
\newcommand{\gN}{\{\mathcal{N}\}}
\newcommand{\gO}{\{\mathcal{O}\}}
\newcommand{\gP}{\{\mathcal{P}\}}
\newcommand{\gQ}{\{\mathcal{Q}\}}
\newcommand{\gR}{\{\mathcal{R}\}}
\newcommand{\gS}{\{\mathcal{S}\}}
\newcommand{\gT}{\{\mathcal{T}\}}
\newcommand{\gU}{\{\mathcal{U}\}}
\newcommand{\gV}{\{\mathcal{V}\}}
\newcommand{\gW}{\{\mathcal{W}\}}
\newcommand{\gX}{\{\mathcal{X}\}}
\newcommand{\gY}{\{\mathcal{Y}\}}
\newcommand{\gZ}{\{\mathcal{Z}\}}

```

% % Sets

```

\newcommand{\sA}{\{\mathbb{A}\}}
\newcommand{\sB}{\{\mathbb{B}\}}
\newcommand{\sC}{\{\mathbb{C}\}}
\newcommand{\sD}{\{\mathbb{D}\}}

```

% % Don't use a set called E, because this would be the same as our symbol

% % for expectation.

```

\newcommand{\sF}{\{\mathbb{F}\}}
\newcommand{\sG}{\{\mathbb{G}\}}
\newcommand{\sH}{\{\mathbb{H}\}}
\newcommand{\sI}{\{\mathbb{I}\}}
\newcommand{\sJ}{\{\mathbb{J}\}}
\newcommand{\sK}{\{\mathbb{K}\}}
\newcommand{\sL}{\{\mathbb{L}\}}
\newcommand{\sM}{\{\mathbb{M}\}}
\newcommand{\sN}{\{\mathbb{N}\}}
\newcommand{\sO}{\{\mathbb{O}\}}
\newcommand{\sP}{\{\mathbb{P}\}}
\newcommand{\sQ}{\{\mathbb{Q}\}}
\newcommand{\sR}{\{\mathbb{R}\}}
\newcommand{\sS}{\{\mathbb{S}\}}
\newcommand{\sT}{\{\mathbb{T}\}}

```

```

\newcommand{\sU}{\{\mathbb{U}\}}
\newcommand{\sV}{\{\mathbb{V}\}}
\newcommand{\sW}{\{\mathbb{W}\}}
\newcommand{\sX}{\{\mathbb{X}\}}
\newcommand{\sY}{\{\mathbb{Y}\}}
\newcommand{\sZ}{\{\mathbb{Z}\}}

```

% % Entries of a matrix

```

\newcommand{\emSigma}{\{\Sigma\}}
\newcommand{\emLambda}{\{\Lambda\}}
\newcommand{\emA}{\{A\}}
\newcommand{\emB}{\{B\}}
\newcommand{\emC}{\{C\}}
\newcommand{\emD}{\{D\}}
\newcommand{\emE}{\{E\}}
\newcommand{\emF}{\{F\}}
\newcommand{\emG}{\{G\}}
\newcommand{\emH}{\{H\}}
\newcommand{\emI}{\{I\}}
\newcommand{\emJ}{\{J\}}
\newcommand{\emK}{\{K\}}
\newcommand{\emL}{\{L\}}
\newcommand{\emM}{\{M\}}
\newcommand{\emN}{\{N\}}
\newcommand{\emO}{\{O\}}
\newcommand{\emP}{\{P\}}
\newcommand{\emQ}{\{Q\}}
\newcommand{\emR}{\{R\}}
\newcommand{\emS}{\{S\}}
\newcommand{\emT}{\{T\}}
\newcommand{\emU}{\{U\}}
\newcommand{\emV}{\{V\}}
\newcommand{\emW}{\{W\}}
\newcommand{\emX}{\{X\}}
\newcommand{\emY}{\{Y\}}
\newcommand{\emZ}{\{Z\}}

```



```

% % entries of a tensor
% % Same font as tensor, without \bm wrapper
% \newcommand{\etens}[1]{\mathsf{#1}}
\newcommand{\etens}[1]{\mathit{\mathsf{#1}} }
\newcommand{\etLambda}{\etens{\Lambda}}
\newcommand{\etA}{\etens{A}}
\newcommand{\etB}{\etens{B}}
\newcommand{\etC}{\etens{C}}
\newcommand{\etD}{\etens{D}}
\newcommand{\etE}{\etens{E}}
\newcommand{\etF}{\etens{F}}
\newcommand{\etG}{\etens{G}}
\newcommand{\etH}{\etens{H}}
\newcommand{\etI}{\etens{I}}
\newcommand{\etJ}{\etens{J}}
\newcommand{\etK}{\etens{K}}
\newcommand{\etL}{\etens{L}}
\newcommand{\etM}{\etens{M}}
\newcommand{\etN}{\etens{N}}
\newcommand{\etO}{\etens{O}}
\newcommand{\etP}{\etens{P}}
\newcommand{\etQ}{\etens{Q}}
\newcommand{\etR}{\etens{R}}
\newcommand{\etS}{\etens{S}}
\newcommand{\etT}{\etens{T}}
\newcommand{\etU}{\etens{U}}
\newcommand{\etV}{\etens{V}}
\newcommand{\etW}{\etens{W}}
\newcommand{\etX}{\etens{X}}
\newcommand{\etY}{\etens{Y}}
\newcommand{\etZ}{\etens{Z}}

```

The command in markdown are defined as follows in mathjax

Click to unfold latex macro definition

```
<script>
window.MathJax = {
  tex: {
    inlineMath: [['$', '$']],
    displayMath: [['$$', '$$']],
    macros: {
      // General commands
      bm: ["\\boldsymbol{#1}", 1],
      sign: "\\operatorname{sign}",
      Tr: "\\operatorname{Tr}",
      E: "\\mathbb{E}",
      KL: "D_{\\mathrm{KL}}",
      NormalDist: "\\mathcal{N}",
      diag: "\\mathrm{diag}",
      Var: "\\mathrm{Var}",
      Cov: "\\mathrm{Cov}",
      standarderror: "\\mathrm{SE}",
      diff: "\\mathrm{d}",
      tran: "^{\\top}",
      inv: "^{-1}",
      rect: "\\mathrm{rectifier}",
      softmax: "\\mathrm{softmax}",
      sigmoid: "\\sigma",
      softplus: "\\zeta",
      R: "\\mathbb{R}",
      emp: "\\tilde{p}",
      lr: "\\alpha",
      reg: "\\lambda",
      Ls: "\\mathcal{L}",

      // Added missing bold Greek matrices
      mBeta: "\\bm{\\beta}",
      mPhi: "\\bm{\\Phi}",
      mLambda: "\\bm{\\Lambda}",
      mSigma: "\\bm{\\Sigma}",
    }
  }
}
```

```
// Random Greek vector
```

```
rvepsilon: "\\bm{\\epsilon}",
```

```
// Greek Vectors
```

```
vzero: "\\bm{0}",
```

```
vone: "\\bm{1}",
```

```
vmu: "\\bm{\\mu}",
```

```
vnu: "\\bm{\\nu}",
```

```
vtheta: "\\bm{\\theta}",
```

```
va: "\\bm{a}", vb: "\\bm{b}", vc: "\\bm{c}", vd: "\\bm{d}", ve: "\\bm{e}",
```

```
vf: "\\bm{f}", vg: "\\bm{g}", vh: "\\bm{h}", vi: "\\bm{i}", vj: "\\bm{j}",
```

```
vk: "\\bm{k}", vl: "\\bm{l}", vm: "\\bm{m}", vn: "\\bm{n}", vo: "\\bm{o}",
```

```
vp: "\\bm{p}", vq: "\\bm{q}", vr: "\\bm{r}", vs: "\\bm{s}", vt: "\\bm{t}",
```

```
vu: "\\bm{u}", vv: "\\bm{v}", vw: "\\bm{w}", vx: "\\bm{x}", vy: "\\bm{y}", vz: "\\bm{z}",
```

```
// Random vectors
```

```
rva: "\\mathbf{a}", rvb: "\\mathbf{b}", rvc: "\\mathbf{c}", rvd: "\\mathbf{d}", rve: "\\mathbf{e}",
```

```
rvf: "\\mathbf{f}", rvg: "\\mathbf{g}", rvh: "\\mathbf{h}", rvi: "\\mathbf{i}", rvj: "\\mathbf{j}",
```

```
rvk: "\\mathbf{k}", rvl: "\\mathbf{l}", rvm: "\\mathbf{m}", rvn: "\\mathbf{n}", rvo: "\\mathbf{o}",
```

```
rvp: "\\mathbf{p}", rvq: "\\mathbf{q}", rvr: "\\mathbf{r}", rvs: "\\mathbf{s}", rvt: "\\mathbf{t}",
```

```
rvu: "\\mathbf{u}", rvv: "\\mathbf{v}", rvw: "\\mathbf{w}", rvx: "\\mathbf{x}", rvy: "\\mathbf{y}", rvz:
```

```
"\\mathbf{z}",
```

```
// Random variables (single letters)
```

```
ra: "{\\textnormal{a}}", rb: "{\\textnormal{b}}", rc: "{\\textnormal{c}}", rd: "{\\textnormal{d}}", re:
```

```
"{\\textnormal{e}}",
```

```
rf: "{\\textnormal{f}}", rg: "{\\textnormal{g}}", rh: "{\\textnormal{h}}", ri: "{\\textnormal{i}}", rj:
```

```
"{\\textnormal{j}}",
```

```
rk: "{\\textnormal{k}}", rl: "{\\textnormal{l}}", rm: "{\\textnormal{m}}", rn: "{\\textnormal{n}}", ro:
```

```
"{\\textnormal{o}}",
```

```
rp: "{\\textnormal{p}}", rq: "{\\textnormal{q}}", rr: "{\\textnormal{r}}", rs: "{\\textnormal{s}}", rt:
```

```
"{\\textnormal{t}}",
```

```
ru: "{\\textnormal{u}}", rv: "{\\textnormal{v}}", rw: "{\\textnormal{w}}", rx: "{\\textnormal{x}}", ry:
```

```
"{\\textnormal{y}}", rz: "{\\textnormal{z}}",
```

```
// Matrices (bold)
```

```
mA: "\\bm{A}", mB: "\\bm{B}", mC: "\\bm{C}", mD: "\\bm{D}", mE: "\\bm{E}",
```

```
mF: "\\bm{F}", mG: "\\bm{G}", mH: "\\bm{H}", mI: "\\bm{I}", mJ: "\\bm{J}",
```

mK: "\\bm{K}", mL: "\\bm{L}", mM: "\\bm{M}", mN: "\\bm{N}", mO: "\\bm{O}",
mP: "\\bm{P}", mQ: "\\bm{Q}", mR: "\\bm{R}", mS: "\\bm{S}", mT: "\\bm{T}",
mU: "\\bm{U}", mV: "\\bm{V}", mW: "\\bm{W}", mX: "\\bm{X}", mY: "\\bm{Y}", mZ: "\\bm{Z}",

// Random Matrices

rmA: "\\mathbf{A}", rmB: "\\mathbf{B}", rmC: "\\mathbf{C}", rmD: "\\mathbf{D}", rmE: "\\mathbf{E}",
rmF: "\\mathbf{F}", rmG: "\\mathbf{G}", rmH: "\\mathbf{H}", rml: "\\mathbf{I}", rmJ: "\\mathbf{J}",
rmK: "\\mathbf{K}", rmL: "\\mathbf{L}", rmM: "\\mathbf{M}", rmN: "\\mathbf{N}", rmO: "\\mathbf{O}",
rmP: "\\mathbf{P}", rmQ: "\\mathbf{Q}", rmR: "\\mathbf{R}", rmS: "\\mathbf{S}", rmT: "\\mathbf{T}",
rmU: "\\mathbf{U}", rmV: "\\mathbf{V}", rmW: "\\mathbf{W}", rmX: "\\mathbf{X}", rmY: "\\mathbf{Y}",
rmZ: "\\mathbf{Z}",

// Elements of random matrices

ermA: "{\\textnormal{A}}", ermB: "{\\textnormal{B}}", ermC: "{\\textnormal{C}}", ermD:
"{\\textnormal{D}}",
ermE: "{\\textnormal{E}}", ermF: "{\\textnormal{F}}", ermG: "{\\textnormal{G}}", ermH:
"{\\textnormal{H}}",
erml: "{\\textnormal{I}}", ermJ: "{\\textnormal{J}}", ermK: "{\\textnormal{K}}", erml:
"{\\textnormal{L}}",
ermM: "{\\textnormal{M}}", ermN: "{\\textnormal{N}}", ermO: "{\\textnormal{O}}", ermP:
"{\\textnormal{P}}",
ermQ: "{\\textnormal{Q}}", ermR: "{\\textnormal{R}}", ermS: "{\\textnormal{S}}", ermT:
"{\\textnormal{T}}",
ermU: "{\\textnormal{U}}", ermV: "{\\textnormal{V}}", ermW: "{\\textnormal{W}}", ermX:
"{\\textnormal{X}}",
ermY: "{\\textnormal{Y}}", ermZ: "{\\textnormal{Z}}",

// Elements of vectors (Greek)

evalpha: "\\alpha",
evbeta: "\\beta",
evepsilon: "\\epsilon",
evlambda: "\\lambda",
evomega: "\\omega",
evmu: "\\mu",
evpsi: "\\psi",
evsigma: "\\sigma",
evtheta: "\\theta",

// Elements of vectors (Latin)

eva: "a", evb: "b", evc: "c", evd: "d", eve: "e",
evf: "f", evg: "g", evh: "h", evi: "i", evj: "j",
evk: "k", evl: "l", evm: "m", evn: "n", evo: "o",
evp: "p", evq: "q", evr: "r", evs: "s", evt: "t",
evu: "u", evv: "v", evw: "w", evx: "x", evy: "y", evz: "z",

// Matrix elements

emSigma: "\\Sigma",
emLambda: "\\Lambda",
emA: "A", emB: "B", emC: "C", emD: "D", emE: "E",
emF: "F", emG: "G", emH: "H", emI: "I", emJ: "J",
emK: "K", emL: "L", emM: "M", emN: "N", emO: "O",
emP: "P", emQ: "Q", emR: "R", emS: "S", emT: "T",
emU: "U", emV: "V", emW: "W", emX: "X", emY: "Y", emZ: "Z",

// Tensors

tens: [{"\\bm{\\mathsf{#1}}",1},
tA: "\\tens{A}", tB: "\\tens{B}", tC: "\\tens{C}", tD: "\\tens{D}", tE: "\\tens{E}",
tF: "\\tens{F}", tG: "\\tens{G}", tH: "\\tens{H}", tI: "\\tens{I}", tJ: "\\tens{J}",
tK: "\\tens{K}", tL: "\\tens{L}", tM: "\\tens{M}", tN: "\\tens{N}", tO: "\\tens{O}",
tP: "\\tens{P}", tQ: "\\tens{Q}", tR: "\\tens{R}", tS: "\\tens{S}", tT: "\\tens{T}",
tU: "\\tens{U}", tV: "\\tens{V}", tW: "\\tens{W}", tX: "\\tens{X}", tY: "\\tens{Y}", tZ: "\\tens{Z}",

// Graph (calligraphic)

gA: "\\mathcal{A}", gB: "\\mathcal{B}", gC: "\\mathcal{C}", gD: "\\mathcal{D}", gE: "\\mathcal{E}",
gF: "\\mathcal{F}", gG: "\\mathcal{G}", gH: "\\mathcal{H}", gI: "\\mathcal{I}", gJ: "\\mathcal{J}",
gK: "\\mathcal{K}", gL: "\\mathcal{L}", gM: "\\mathcal{M}", gN: "\\mathcal{N}", gO: "\\mathcal{O}",
gP: "\\mathcal{P}", gQ: "\\mathcal{Q}", gR: "\\mathcal{R}", gS: "\\mathcal{S}", gT: "\\mathcal{T}",
gU: "\\mathcal{U}", gV: "\\mathcal{V}", gW: "\\mathcal{W}", gX: "\\mathcal{X}", gY: "\\mathcal{Y}",
gZ: "\\mathcal{Z}",

// Sets

sA: "\\mathbb{A}", sB: "\\mathbb{B}", sC: "\\mathbb{C}", sD: "\\mathbb{D}",
sF: "\\mathbb{F}", sG: "\\mathbb{G}", sH: "\\mathbb{H}", sI: "\\mathbb{I}", sJ: "\\mathbb{J}",
sK: "\\mathbb{K}", sL: "\\mathbb{L}", sM: "\\mathbb{M}", sN: "\\mathbb{N}", sO: "\\mathbb{O}",
sP: "\\mathbb{P}", sQ: "\\mathbb{Q}", sR: "\\mathbb{R}", sS: "\\mathbb{S}", sT: "\\mathbb{T}",
sU: "\\mathbb{U}", sV: "\\mathbb{V}", sW: "\\mathbb{W}", sX: "\\mathbb{X}", sY: "\\mathbb{Y}", sZ:
"\\mathbb{Z}"
}

```
}  
};  
</script>  
<script id="MathJax-script" async src="https://cdn.jsdelivr.net/npm/mathjax@3/es5/tex-  
html-full.js"></script>
```