abaisero.sty

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1 Options

Options are processes left-to-right. If no options are provided, or none are enabled by the end of the processing, then by default they are all considered to be enabled.

Option	Description
`all`	Enable all commands
`(no-)sets`	Disable/enable set commands
`(no-)math`	Disable/enable mathematical commands
`(no-)linalg`	Disable/enable linear algebra commands
`(no-)optim`	Disable/enable optimization commands
`(no-)stats`	Disable/enable statistics commands
`(no-)dists`	Disable/enable distributions commands
`(no-)ml`	Disable/enable machine learning commands
`(no-)rl`	Disable/enable reinforcement learning commands
`(no-)marl`	Disable/enable multi-agent reinforcement learning commands
`(no-)theorem`	Disable/enable theorem commands
`(no-)misc`	Disable/enable miscellanea commands

2 Commands

Option [sets]

Symbol	Command	Description	Example
$\mathcal{A}$	`\aset`	A set	
$\mathcal{B}$	`\bset`	B set	
$\mathcal{C}$	`\cset`	C set	
$\vdots$	$\vdots$	$\vdots$	
$\mathcal{X}$	`\xset`	X set	
$\mathcal{Y}$	`\yset`	Y set	
$\mathcal{Z}$	`\zset`	Z set	

Option [math]

Symbol	Command	Description	Example
$\mathbb{N}$	`\naturalset`	the set of natural numbers	$\mathbb{N} \doteq \{1, 2, 3, \ldots\}$
$\mathbb{Z}$	`\integerset`	the set of integer numbers	$\mathbb{Z} \doteq \{0, 1, -1, 2, -3, \ldots\}$
$\mathbb{R}$	`\realset`	the set of real numbers	$\sqrt{2} \in \mathbb{R}$
*	`\kstar`	the Kleene star operator	$\mathcal{X}^* \doteq \bigcup_{k=0}^{\infty} \mathcal{X}^k$
$^+$	`\kplus`	the Kleene plus operator	$\mathcal{X}^+ \doteq \bigcup_{k=1}^{\infty} \mathcal{X}^k$
$\mathcal{P}$	`\powerset`	power set	$\mathcal{P}(\mathcal{X}) \doteq \left\{ \hat{\mathcal{X}} \mid \hat{\mathcal{X}} \subseteq \mathcal{X} \right\}$
$\mathbb{I}$	`\Ind`	Indicator function	$\Pr(x = 0) = \mathbb{E}\left[\mathbb{I}\left[x = 0\right]\right]$
$[\![\cdot]\!]$	`\iverson{\cdot}`	Iverson brackets	$[\![x \geq 0]\!]$ maps x to binaries
sign	`\sign`		$x = \operatorname{sign} x \cdot \lvert x \rvert$
supp	`\supp`	support operator	$\operatorname{supp}(f) \doteq \{x \mid f(x) \neq 0\}$
softmax	`\softmax`	a.k.a. logsumexp, realsoftmax[1]	$\operatorname{softmax}(x_1, \ldots, x_n) \doteq \log \sum_i \exp(x_i)$
softmin	`\softmin`		$\operatorname{softmin}(x_1, \ldots, x_n) \doteq -\log \sum_i \exp(-x_i)$
softargmax	`\softargmax`	a.k.a. softmax[1]	$\operatorname{softargmax}(x_1, \ldots, x_n)_i \doteq \frac{\exp(x_i)}{\sum_k \exp(x_k)}$
softplus	`\softplus`	Softplus function	$\operatorname{softplus}(x) \doteq \log\left(\exp(x) + 1\right) = \operatorname{softmax}(x, 0)$

Option [linalg]

Symbol	Command	Description	Example
diag	`\diag`		
rank	`\rank`		
tr	`\trace`		$\operatorname{tr}(M) \doteq \sum_{i=1}^{n} M_{ii}$
col	`\colspace`		
ker	`\nullspace`	Nullspace (a.k.a kernel) of a linear mapping	
span	`\spanspace`		
$^\top$	`\T`	Transpose superscript	symmetric $M \implies M = M^\top$
$^{-1}$	`\I`	Inverse superscript	invertible $M \implies MM^{-1} = I$
$^+$	`\PI`	Pseudo-inverse superscript	$MM^+M = M$
$^{-\top}$	`\IT`	Inverse transpose superscript	$M^{-\top} = (M^{-1})^\top = (M^\top)^{-1}$
$^{+\top}$	`\PIT`	Pseudo-inverse transpose superscript	$M^{+\top} = (M^+)^\top = (M^\top)^+$

Option [optim]

Symbol	Command	Description	Example
argmax	`\argmax`		$\operatorname{argmax}_a Q^\pi(s, a)$
argmin	`\argmin`		$\theta^* \doteq \operatorname{argmin}_\theta \mathcal{L}(\theta)$
*	`\opt`	Optimality superscript	$\pi^*(s) = \operatorname{argmax}_a Q^*(s, a)$
stop	`\stopg`	Stop-gradient operator	$\nabla_x \operatorname{stop}\left[f(x)\right] = 0$

[1]The functions that in this document are called "softmax" and "softargmax" are poorly and inaccurately named in the broader math and ML fields (see `https://en.wikipedia.org/wiki/Softmax_function` and `https://en.wikipedia.org/wiki/LogSumExp`). Rather than stick to the more common naming conventions, I opt to rename the functions more accurately to appropriately reflect their actual properties. In any document where I would use these functions, I would need to define them anyway, so the risk of misunderstandings are minimal.

Option [stats]

Symbol	Command	Description	Example
$\perp$	`\indep`	Independence	$X \perp Y \mid Z$
do	`\causaldo`	Pearl's *do* operator	$\Pr(Y \mid \mathrm{do}(X = x)) \neq \Pr(Y \mid X = s)$
$\mathbb{C}$	`\Cov`	Covariance	$\mathbb{C}(x, y) = \mathbb{E}\left[xy\right] - \mathbb{E}\left[x\right]\mathbb{E}\left[y\right]$
$\mathbb{H}$	`\Ent`	Entropy	$\mathbb{H}[x] = -\mathbb{E}\left[\log \Pr(x)\right]$
$\mathbb{E}$	`\Exp`	Expectation	$\mathbb{E}\left[f(x)\right] = \sum_x \Pr(x) f(x)$
KL	`\KL`	KL-divergence	$\mathrm{KL}\left(p \mid\mid q\right) \doteq \mathbb{E}_{x \sim p}\left[\log p(x) - \log q(x)\right]$
D_{KL}	`\DKL`	KL-divergence (alternative)	
$\mathbb{I}$	`\MI`	Mutual Information	
$\mathbb{B}$	`\Bias`	Bias	$\mathbb{B}\left[\hat{f}(x)\right]$ is the bias of estimator $\hat{f}$
$\mathbb{V}$	`\Var`	Variance	$\mathbb{V}\left[\hat{f}(x)\right] = \mathbb{E}\left[\hat{f}(x)^2\right] - \mathbb{E}\left[\hat{f}(x)\right]^2$

Option [dists]

Symbol	Command	Description	Example
Categorical	`\Categorical`	Categorical	
Dirichlet	`\Dirichlet`	Dirichlet	
Geometric	`\Geometric`	Geometric	
Normal	`\Normal`	Normal	
Uniform	`\Uniform`	Uniform	

Option [ml]

Symbol	Command	Description	Example
$\mathcal{D}$	`\data`	Data set	$\mathcal{D} \doteq \{(x_i, y_i)\}_{i=1}^N$
$\mathcal{L}$	`\loss`	Loss function	$\mathcal{L}(\theta; x, y) = \frac{1}{2}\lVert y - f(x;\theta)\rVert^2$
nll	`\nll`	Neg-log-likelihood	$\mathrm{nll}(x) \doteq -\log \Pr(x)$
MSE	`\mse`	Mean-squared-error	
$\rightsquigarrow$	`\trainedto`	Model is trained to approximate some value	$\hat{V}(s) \rightsquigarrow V^\pi(s) \overset{\text{hope}}{\Longrightarrow} \hat{V}(s) \approx V^\pi(s)$

Option [rl]

Symbol	Command	Description	Example
$\mathcal{A}$	`\aset`	Action set	
$\mathcal{B}$	`\bset`	Belief set	
$\mathcal{H}$	`\hset`	History set	
$\mathcal{O}$	`\oset`	Observation set	
$\mathcal{R}$	`\rset`	Reward set	
$\mathcal{S}$	`\sset`	State set	
ε	`\nohistory`	Empty history	
π	`\policy`	policy	
Q^π	`\qpolicy`	Q policy values	
Q^μ	`\qpolicy[\mu]`	Q policy values	
$\hat{Q}$	`\qmodel`	Parametric model	
V^π	`\vpolicy`	V policy values	
V^μ	`\vpolicy[\mu]`	V policy values	
$\hat{V}$	`\vmodel`	Parametric model	
A^π	`\apolicy`	A policy values	
A^μ	`\apolicy[\mu]`	A policy values	
$\hat{A}$	`\amodel`	Parametric model	
U^π	`\upolicy`	U policy values	
U^μ	`\upolicy[\mu]`	U policy values	
$\hat{U}$	`\umodel`	Parametric model	
B_π	`\bpolicy`	Policy Bellman operator	
B_μ	`\bpolicy[\mu]`	Policy Bellman operator	

Option [marl]

Symbol	Command	Description	Example
$\boldsymbol{x}$	`\joint{x}`	Joint formatting (redefinable)	
$\boldsymbol{\mathcal{A}}$	`\jaset`	Joint action set	
$\boldsymbol{\mathcal{O}}$	`\joset`	Joint observation set	
$\boldsymbol{\mathcal{H}}$	`\jhset`	Joint history set	
$\boldsymbol{A}, \boldsymbol{a}$	`\jA`, `\ja`	Joint action	$\boldsymbol{A} = \boldsymbol{a} \in \boldsymbol{\mathcal{A}}$
$\boldsymbol{O}, \boldsymbol{o}$	`\jO`, `\jo`	Joint observation	$\boldsymbol{O} = \boldsymbol{o} \in \boldsymbol{\mathcal{O}}$
$\boldsymbol{H}, \boldsymbol{h}$	`\jH`, `\jh`	Joint history	$\boldsymbol{H} = \boldsymbol{h} \in \boldsymbol{\mathcal{H}}$
$\boldsymbol{b}$	`\jb`	Joint belief	$\boldsymbol{b}\colon \boldsymbol{\mathcal{H}} \to \Delta\mathcal{S}$
$\boldsymbol{\pi}$	`\jpolicy`	Joint policy	$\boldsymbol{\pi}(\boldsymbol{h}, \boldsymbol{a}) \doteq \prod_i \pi_i(h_i, a_i)$
$Q^{\boldsymbol{\pi}}$	`\jqpolicy`	Q joint-policy values	
$V^{\boldsymbol{\pi}}$	`\jvpolicy`	V joint-policy values	
$A^{\boldsymbol{\pi}}$	`\japolicy`	A joint-policy values	
$U^{\boldsymbol{\pi}}$	`\jupolicy`	U joint-policy values	
$B_{\boldsymbol{\pi}}$	`\jbpolicy`	Joint policy Bellman operator	
$B_{\boldsymbol{\mu}}$	`\jbpolicy[\joint\mu]`	Joint policy Bellman operator	
f_{mix}	`\fmix`	Mixing function	$f_{\mathrm{mix}}(\boldsymbol{h}, \boldsymbol{a}, Q_1(h_1), \ldots, Q_n(h_n))$
f_{mono}	`\fmono`	Monotonic mixing function	$f_{\mathrm{mono}}(u_1, \ldots, u_n)$
f_{IGM}	`\figm`	IGM mixing function	$f_{\mathrm{IGM}}(\boldsymbol{h}, \boldsymbol{a}, Q_1(h_1), \ldots Q_n(h_n))$
$\hat{Q}_{\mathrm{VDN}}$	`\qvdn`	VDN Q-model	
$\hat{V}_{\mathrm{VDN}}$	`\vvdn`	VDN V-model	
$\hat{A}_{\mathrm{VDN}}$	`\avdn`	VDN A-model	
$\hat{Q}_{\mathrm{MIX}}$	`\qmix`	QMIX Q-model	
$\hat{V}_{\mathrm{MIX}}$	`\vmix`	QMIX V-model	
$\hat{A}_{\mathrm{MIX}}$	`\amix`	QMIX A-model	
$\hat{Q}_{\mathrm{TRAN}}$	`\qtran`	QTRAN Q-model	
$\hat{V}_{\mathrm{TRAN}}$	`\vtran`	QTRAN V-model	
$\hat{A}_{\mathrm{TRAN}}$	`\atran`	QTRAN A-model	
$\hat{Q}_{\mathrm{WMIX}}$	`\wqmix`	WQMIX Q-model	
$\hat{V}_{\mathrm{WMIX}}$	`\wvmix`	WQMIX V-model	
$\hat{A}_{\mathrm{WMIX}}$	`\wamix`	WQMIX A-model	
$\hat{Q}_{\mathrm{PLEX}}$	`\qplex`	QPLEX Q-model	
$\hat{V}_{\mathrm{PLEX}}$	`\vplex`	QPLEX V-model	
$\hat{A}_{\mathrm{PLEX}}$	`\aplex`	QPLEX A-model	
$\hat{Q}_{\mathrm{FIX}}$	`\qfix`	QFIX Q-model	
$\hat{V}_{\mathrm{FIX}}$	`\vfix`	QFIX V-model	
$\hat{A}_{\mathrm{FIX}}$	`\afix`	QFIX A-model	

Option [theorem]

Symbol	Command	Description	Example

	`\begin{definition}`, `\end{definition}`
	`\begin{assumption}`, `\end{assumption}`
	`\begin{example}`, `\end{example}`		

	`\begin{axiom}`, `\end{axiom}`
	`\begin{conjecture}`, `\end{conjecture}`
	`\begin{proposition}`, `\end{proposition}`
	`\begin{lemma}`, `\end{lemma}`
	`\begin{theorem}`, `\end{theorem}`
	`\begin{corollary}`, `\end{corollary}`
	`\begin{generalization}`, `\end{generalization}`		

Option [misc]

Symbol	Command	Description	Example
†	`\D`	Dagger superscript	
$^{(k)}$	`\iter{k}`	Superscript indicating iteration	

Option [utils]

Symbol	Command	Description	Example
$\boxed{}$	`\phantomeq`	The width of an =, for alignment purposes (bounding box shown)	