The statmath package*

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Abstract

Applied and theoretical papers in statistics usually contain a number of notational conventions which are currently lacking in the popular amsmath package. This package provides commands for such standard statistical-mathematical language, including bold Roman and Greek letters, convergence symbols, matrix operations.

1 Introduction

Applied and theoretical papers in statistics usually contain a number of notational conventions which are currently lacking in the popular amsmath package. The seasoned IATEX user will see that the provided commands are simple, almost trivial, but will hopefully offer less cluttered preambles as well as a welcome help for novice users.

2 Usage

Capital Roman letter: A \bfA Lower-case Roman letter: a \bfa \bfGamma Capital Greek letter: Γ \bfalpha Lower-case Greek letter: α Bold zero: $\mathbf{0}$ \bfzero \cov Covariance: Cov(X, Y)Expectation: E(X)\E Variance: V(X)\۷ Convergence almost surely: $X_n \stackrel{a.s.}{\to} X$ \inas Convergence in probability: $X_n \stackrel{p}{\to} X$ \inprob Convergence in distribution: $X_n \stackrel{d}{\to} X$ \indist Probability limit: $plim X_n = X$ \plim \tr Trace of matrix: $tr(\mathbf{A})$ Vectorization of matrix: $vec(\mathbf{A})$

^{*}This document corresponds to statmath v0.1, dated 2018/03/08.

```
\vcs Strict half-vectorization of matrix: \operatorname{vecs}(\mathbf{A})
\vch Half-vectorization of matrix: \operatorname{vech}(\mathbf{A})
\diag Diagonal of matrix: \operatorname{diag}(\mathbf{A})
\argmin Minimize argument: \hat{\theta} = \operatorname{arg\,min}_{\theta \in \Theta} f(\theta)
\argmax Maximize argument: \hat{\theta} = \operatorname{arg\,max}_{\theta \in \Theta} f(\theta)
```

3 Implementation

The default is to use \mathbf for Roman letters and \boldsymbol for Greek letters. Both can be changed (individually) to \bm.

```
1 \RequirePackage{amsmath}
2 \RequirePackage{bm}%
4 \DeclareOption{abcbm}{%
     \let\abcbf\bm%
5
6 }
7 \DeclareOption{greekbm}{%
     \let\greekbf\bm%
9 }
10 \DeclareOption{abcbf}{%
11 \let\abcbf\mathbf%
12 }
13 \DeclareOption{greekbs}{%
14 \let\greekbf\boldsymbol%
15 }
16
17 \ExecuteOptions{abcbf,greekbs}
19 \ProcessOptions\relax
```

3.1 Bold letters and symbols

\bfA Capital letters are obtained by \bfA, \bfB, etc. The command \abcbf is either \textbf or \bm, depending on options abcbf or abcbm.

```
20 \newcommand{\bfA}{\abcbf A}
21 \newcommand{\bfB}{\abcbf B}
22 \newcommand{\bfC}{\abcbf C}
23 \newcommand{\bfD}{\abcbf D}
24 \newcommand{\bfE}{\abcbf E}
25 \newcommand{\bfF}{\abcbf F}
26 \newcommand{\bfG}{\abcbf G}
27 \newcommand{\bfH}{\abcbf H}
28 \newcommand{\bfI}{\abcbf I}
29 \newcommand{\bfI}{\abcbf J}
30 \newcommand{\bfK}{\abcbf K}
31 \newcommand{\bfL}{\abcbf L}
```

```
32 \newcommand{\bfM}{\abcbf M}
33 \newcommand{\bfN}{\abcbf N}
34 \newcommand{\bfO}{\abcbf O}
35 \newcommand{\bfP}{\abcbf P}
36 \newcommand{\bfP}{\abcbf Q}
37 \newcommand{\bfR}{\abcbf R}
38 \newcommand{\bfS}{\abcbf S}
39 \newcommand{\bfT}{\abcbf T}
40 \newcommand{\bfT}{\abcbf U}
41 \newcommand{\bfV}{\abcbf V}
42 \newcommand{\bfW}{\abcbf W}
43 \newcommand{\bfX}{\abcbf X}
44 \newcommand{\bfY}{\abcbf Y}
45 \newcommand{\bfT}{\abcbf Y}
```

\bfa Lower-case letters are obtained by \bfa, \bfb, etc. The command \abcbf is either \textbf or \bm, depending on options abcbf or abcbm.

```
46 \mbox{ newcommand{\bfa}{\abcbf a}}
47 \newcommand{\bfb}{\abcbf b}
48 \newcommand{\bfc}{\abcbf c}
49 \newcommand{\bfd}{\abcbf d}
50 \newcommand{\bfe}{\abcbf e}
51 \newcommand{\bff}{\abcbf f}
52 \neq 52 \pmod{\bfg}{\abcbf g}
53 \neq h
54 \mbox{ newcommand{\bfi}{\abcbf i}}
55 \mbox{ newcommand{\bfj}{\abcbf j}}
56 \mbox{ \newcommand{\bfk}{\abcbf k}}
57 \mbox{ newcommand{\bfl}{\abcbf 1}}
58 \newcommand{\bfm}{\abcbf m}
59 \newcommand{\bfn}{\abcbf n}
60 \newcommand{\bfo}{\abcbf o}
61 \newcommand{\bfp}{\abcbf p}
62 \neq 0 
63 \newcommand{\bfr}{\abcbf r}
64 \mbox{ \newcommand{\bfs}{\abcbf s}}
65 \newcommand{\bft}{\abcbf t}
66 \mbox{ \newcommand{\bfu}{\abcbf u}}
67 \newcommand{\bfv}{\abcbf v}
68 \newcommand{\bfw}{\abcbf w}
69 \newcommand{\bfx}{\abcbf x}
70 \newcommand{\bfy}{\abcbf y}
71 \newcommand{\bfz}{\abcbf z}
```

\bfalpha Lower-case Greek letters are obtained by \bfalpha, \bfbeta, etc. The command \greekbf is either \boldsymbol or \bm, depending on options greekbs or greekbm.

```
72 \mbox{\newcommand{\bfalpha}{\greekbf \alpha}}
```

^{73 \}newcommand{\bfbeta}{\greekbf \beta}

```
75 \newcommand{\bfepsilon}{\greekbf \epsilon}
          76 \newcommand{\bfvarepsilon}{\greekbf \varepsilon}
          77 \newcommand{\bfzeta}{\greekbf \zeta}
          78 \newcommand{\bfeta}{\greekbf \eta}
          79 \newcommand{\bftheta}{\greekbf \theta}
          80 \newcommand{\bfvartheta}{\greekbf \vartheta}
          81 \mbox{ \newcommand{\bfgamma}{\greekbf \gamma}}
          82 \newcommand{\bfkappa}{\greekbf \kappa}
          83 \newcommand{\bflambda}{\greekbf \lambda}
          84 \newcommand{\bfmu}{\greekbf \mu}
          85 \newcommand{\bfnu}{\greekbf \nu}
          86 \newcommand{\bfxi}{\greekbf \xi}
          87 \newcommand{\bfpi}{\greekbf \pi}
          88 \newcommand{\bfvarpi}{\greekbf \varpi}
          89 \newcommand{\bfrho}{\greekbf \rho}
          90 \newcommand{\bfvarrho}{\greekbf \varrho}
          91 \newcommand{\bfsigma}{\greekbf \sigma}
          92 \newcommand{\bfvarsigma}{\greekbf \varsigma}
          93 \newcommand{\bftau}{\greekbf \tau}
          94 \newcommand{\bfupsilon}{\greekbf \upsilon}
          95 \newcommand{\bfphi}{\greekbf \phi}
          96 \newcommand{\bfvarphi}{\greekbf \varphi}
          97 \newcommand{\bfchi}{\greekbf \chi}
          98 \newcommand{\bfpsi}{\greekbf \psi}
          99 \newcommand{\bfomega}{\greekbf \omega}
         100 \newcommand{\bfiota}{\greekbf \iota}
\bfGamma Capital Greek letters are obtained by \bfGamma, \bfDelta, etc. The com-
          mand \greekbf is either \boldsymbol or \bm, depending on options greekbs
          or greekbm.
         101 \newcommand{\bfGamma}{\greekbf \Gamma}
         102 \newcommand{\bfDelta}{\greekbf \Delta}
         103 \newcommand{\bfTheta}{\greekbf \Theta}
         104 \newcommand{\bfLambda}{\greekbf \Lambda}
         105 \newcommand{\bfXi}{\greekbf \Xi}
         106 \newcommand{\bfPi}{\greekbf \Pi}
         107 \newcommand{\bfSigma}{\greekbf \Sigma}
         108 \verb|\newcommand{\bfUpsilon}{\greekbf \Vpsilon}|
         109 \mbox{\local{fhi}{\greekbf \Phi}}
         110 \newcommand{\bfPsi}{\greekbf \Psi}
         111 \newcommand{\bfOmega}{\greekbf \Omega}
 \bfzero Bold zero. The command \greekbf is either \boldsymbol or \bm, depending on
          options greekbs or greekbm.
```

74 \newcommand{\bfdelta}{\greekbf \delta}

3.2 Statistical operators and concepts

112 \newcommand{\bfzero}{\greekbf 0}

Statistical operators for covariance, expectation and variance.

```
\cov
        113 \DeclareMathOperator{\cov}{Cov}
     \E
        114 \DeclareMathOperator{\E}{E}
     \۷
        115 \DeclareMathOperator{\V}{V}
  \ninas
        116 \newcommand{\inas}{\overset{a.s.}{\to}}
\inprob
        117 \newcommand{\indist}{\overset{d}{\to}}
\indist
        118 \mbox{newcommand{\inprob}{\overset{p}{\to}}}
  \plim
        119 \verb|\DeclareMathOperator{\plim}{plim}|
                Matrix and mathematical operators
    \tr
        120 \DeclareMathOperator{\tr}{tr}
    \vc
        121 \DeclareMathOperator{\vc}{vec}
   \vcs
        122 \label{localized} $$122 \end{areMathOperator} {\vcs} {\vcs} $$
   \vch
        123 \DeclareMathOperator{\vch}{vech}
  \diag
        124 \DeclareMathOperator{\diag}{diag}
\argmin
        125 \verb|\DeclareMathOperator{\argmin}{arg\,min}|
\argmax
        126 \ensuremath Operator {\argmax} {arg\n,max}
```