notation

Notation

Symbol	Meaning
s	the space index
t	the time index
$i : 1, 2, \cdots, n$	the space index for each individual location
$j : 1, 2, \cdots, J$	the time index for each individual timestamp
j^*, $m : 0, 1, \cdots, 11$	the time index for indexing time by month
$\mathcal{D}_s$ and $\mathcal{D}_t$	the parameter space for spatial and temporal
$f_\phi(.)$	the function on temporal processing with parameters ϕ
$g_\theta(.)$	the function on spatial aggregation with parameter θ
$h(.)$	the function on variable transformation, no parameter
$F_\eta(.)$	the PDF to fit the data with parameter η
$\Phi^{-1}(.)$	the quantile (inverse CDF) function

Step	Notation	Notes
Raw data	$\mathbf{X}(\mathbf{s};\mathbf{t})$, $x_p(s_i;t_j)$	$\mathbf{s} \in \mathcal{D}_s$, $\mathcal{D}_s \subseteq \mathbb{R}^2$, $\mathbf{s} = (s_1, s_2, \cdots, s_n)'$ $t \in \mathcal{D}_t$, $\mathbf{t} = (t_1, t_2, \cdots, t_J)'$ $\mathbf{X}(\mathbf{s};\mathbf{t}) = (x_1(\mathbf{s};\mathbf{t}), x_2(\mathbf{s};\mathbf{t}), \cdots, x_P(\mathbf{s};\mathbf{t}))'$ when the pipeline step can be written in univariate case, the data will be referred to as $x(\mathbf{s};\mathbf{t})$
Variable transformation	$h(x(\mathbf{s};\mathbf{t}))$	TODO: to be filled

Step	Notation	Notes
Temporal processing	$f_\phi(x(\mathbf{s};\mathbf{t}))$	Special case 1: aggregate across a time scale of k: $f_k(\mathbf{X}(\mathbf{s};\mathbf{t})) = \sum_{l=t-k+1}^{t} \mathbf{X}(\mathbf{s};\mathbf{t})$ [TODO: check again] Special case 2: aggregate with a kernel weight w_{ij}: $f_{w_{ij}}(\mathbf{X}(s_i;t_j)) = \sum_{l=t-k+1}^{t} w_{ij}\mathbf{X}(s_i;t_j)$
Spatial aggregation	$g_\theta(x(\mathbf{s};\mathbf{t}))$	
Normalising	$\Phi^{-1}[F_\eta(x(\mathbf{s};\mathbf{t}))]$	Special case: When PDF $F(.)$ is separately fitted for each month: $\Phi^{-1}[F_\eta^m(x(\mathbf{s};t_{j^*}))]$ where j^* is all the indexes that satisfy $j^* \mod 12 = m$ for each $m = 0, 1, \cdots, 11$

TODO:

- look at how temporal aggregation (processing) is written in journals