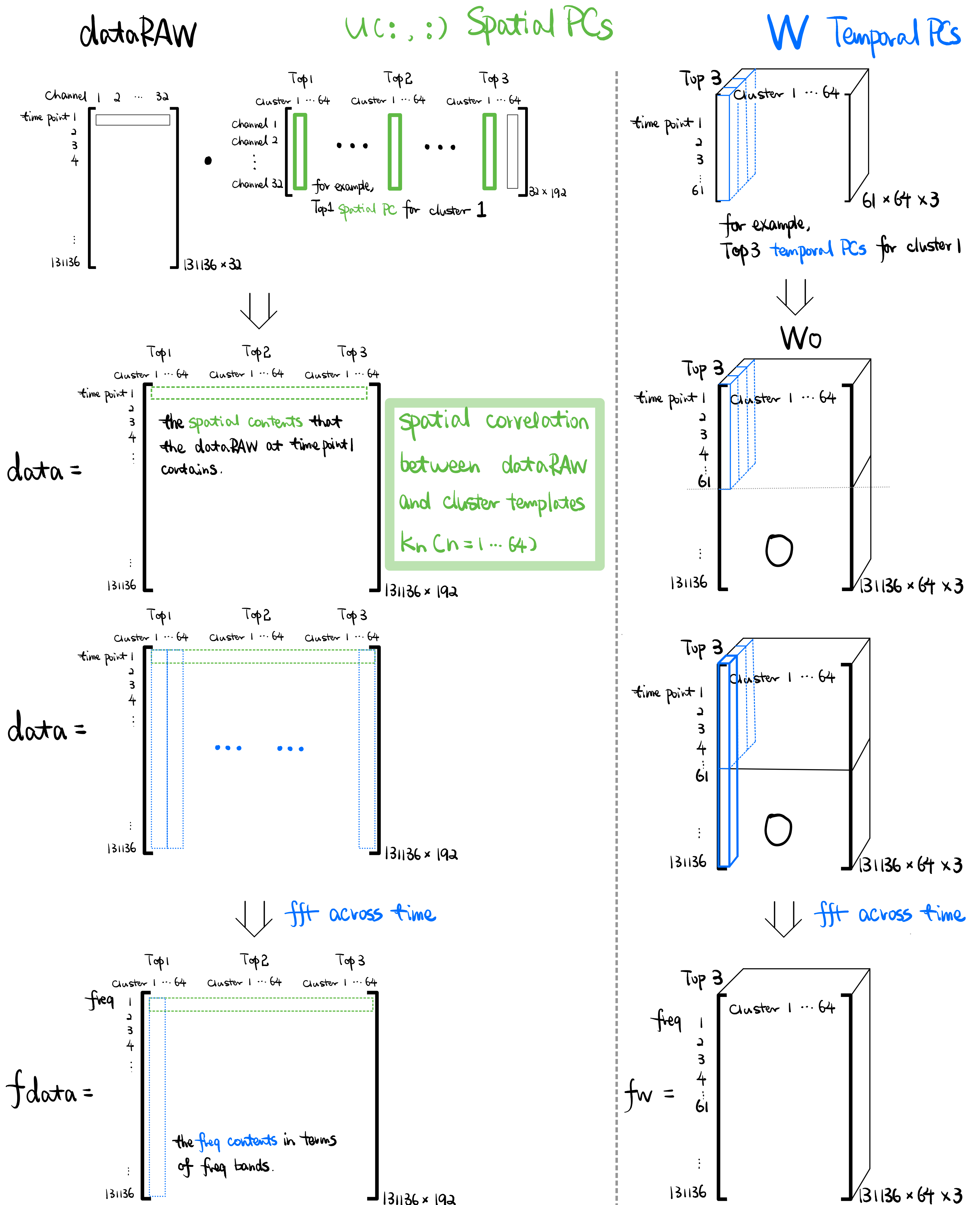
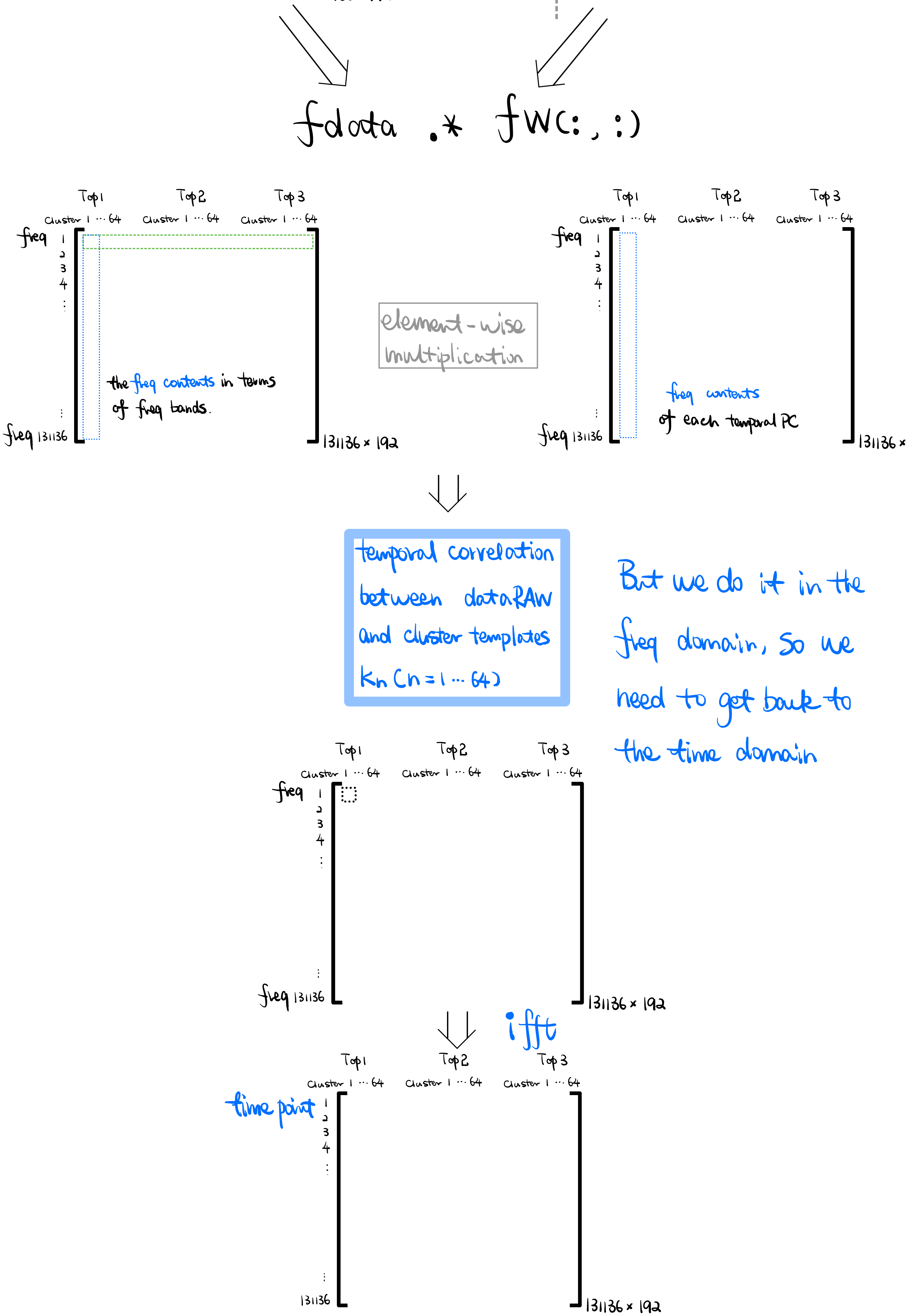
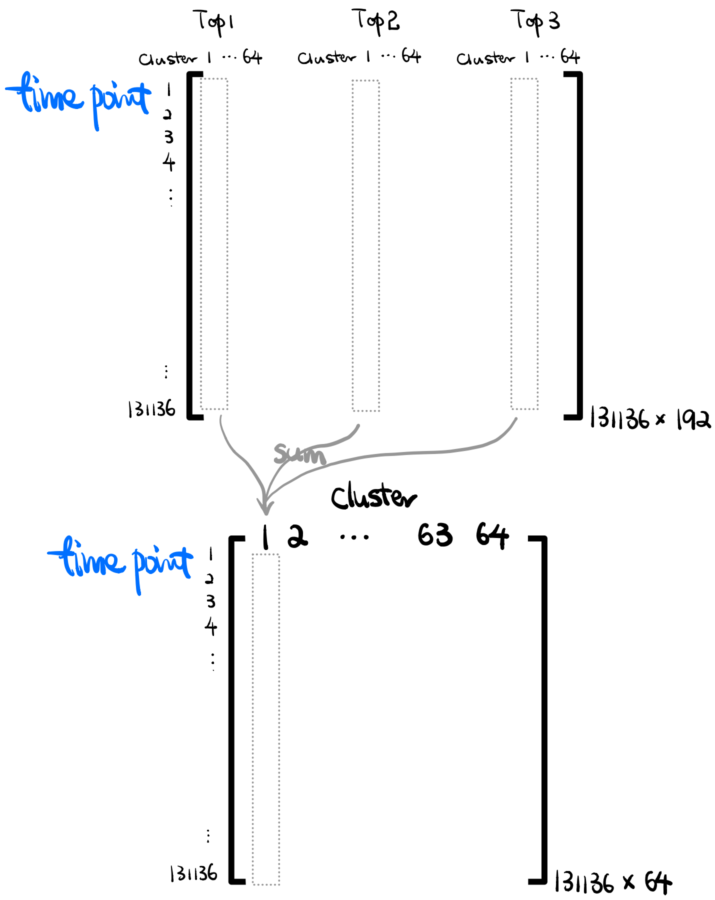
mexMPregMUcpu.m





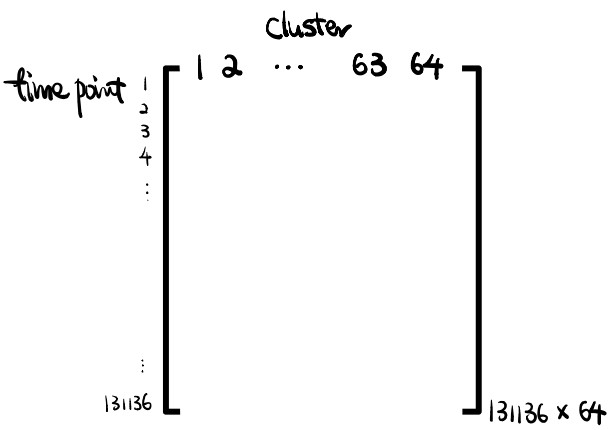
fdata .* fw(:, :)
Top1 Top2 Top3
Cluster 1 ··· 64 Cluster 1 ··· 64 Cluster 1 ··· 64
freq 1 2 3 4 ⋮ ⋮ freq 131136
the freq contents in terms of freq bands.
131136 × 192
element-wise multiplication
Top1 Top2 Top3
Cluster 1 ··· 64 Cluster 1 ··· 64 Cluster 1 ··· 64
freq 1 2 3 4 ⋮ ⋮ freq 131136
freq contents of each temporal PC
131136 ×
temporal correlation between dataRAW and cluster templates Kn (n = 1 ··· 64)
But we do it in the freq domain, so we need to get back to the time domain
Top1 Top2 Top3
Cluster 1 ··· 64 Cluster 1 ··· 64 Cluster 1 ··· 64
freq 1 2 3 4 ⋮ ⋮ freq 131136
131136 × 192
ifft
Top1 Top2 Top3
Cluster 1 ··· 64 Cluster 1 ··· 64 Cluster 1 ··· 64
time point 1 2 3 4 ⋮ ⋮ 131136
131136 × 192



proj =

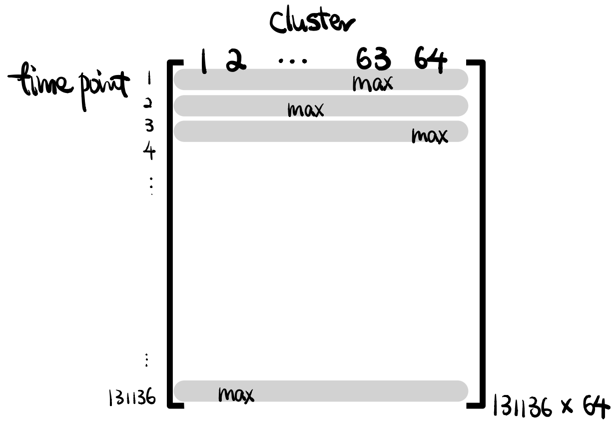
$$\Downarrow$$

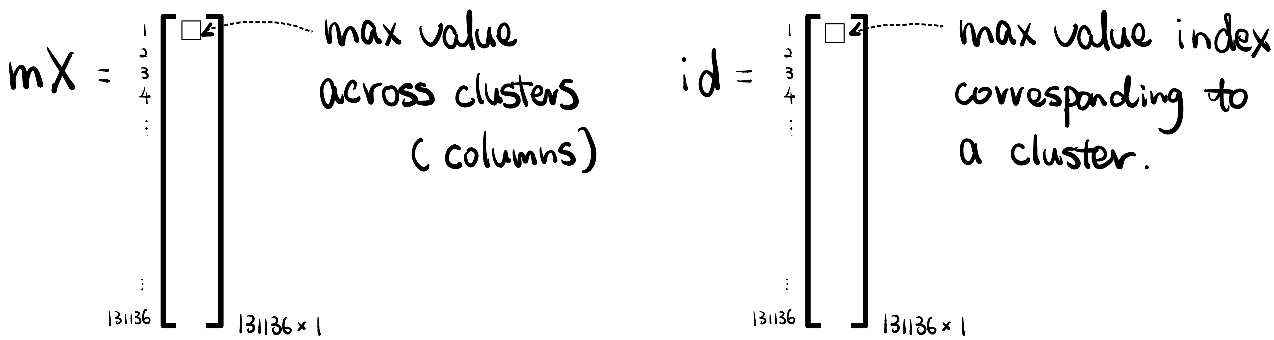
$$dC(n,t) = \frac{\left(proj(t,n) + \mu_n \cdot lam\right)^2}{1 + lam} - \mu_n^2 \cdot lam$$



$$\Downarrow$$

$$[mX, id] = \max(\ dC(n,t)\ , [\ ], 2\ )$$



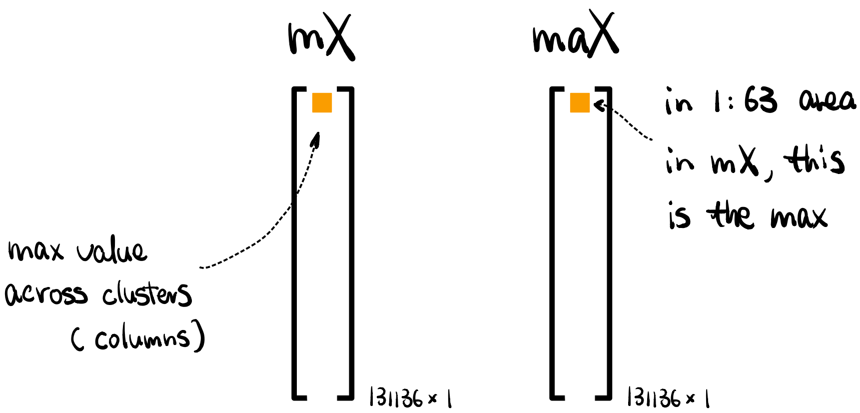


$\Downarrow$

maX = -my_min(-mX, 31, 1)

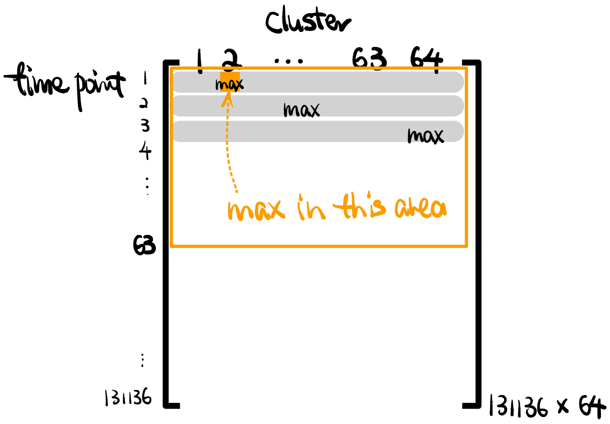
means the maxmun value across each 63 × 1 area in mX

$\Downarrow$



mX(1,1) + 1e-3 > maX(1,1)

means mX(1,1) is the max across 63 time sample points.

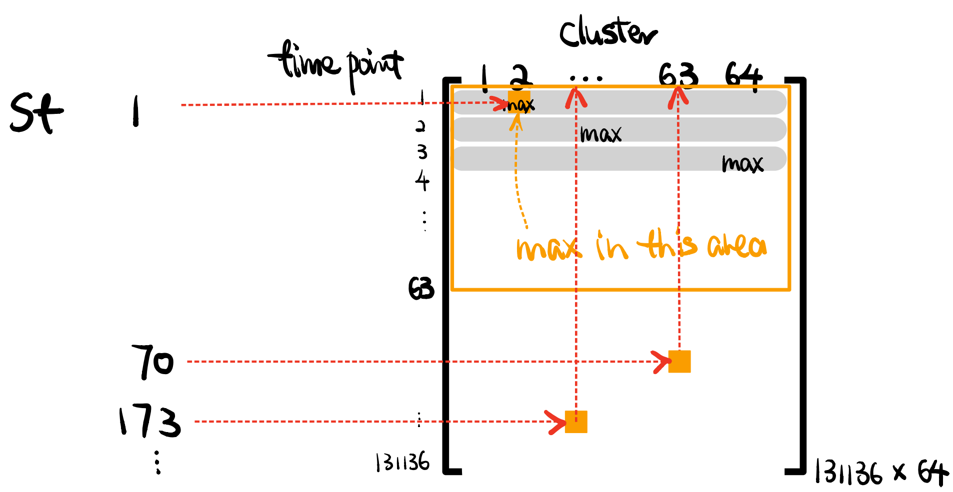


$$mX > Th^2$$

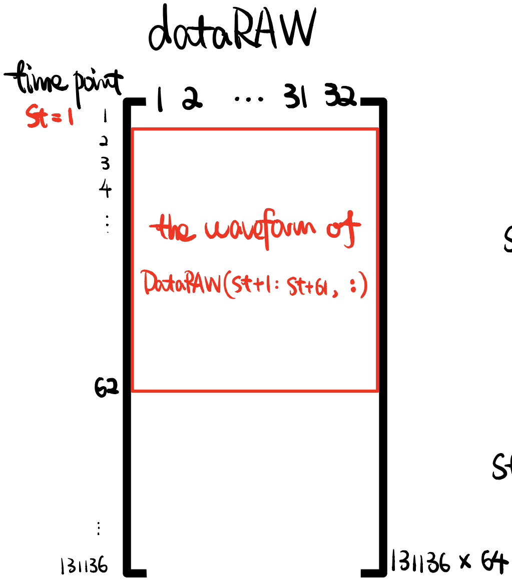
means only the decrease of dC(n,t) is bigger than Th^2 is an effective fitting

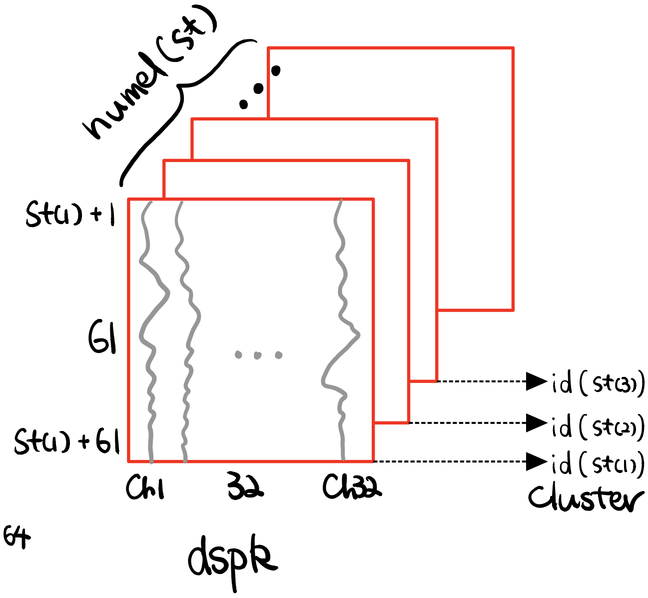
find the index of spike time $\quad st = \text{find}\left(mX + 1e\text{-}3 > \max \;\&\; mX > Th^2 \right)$

find the cluster of the spike st $\quad id = id(st)$



find the waveform of the spike st





update the template for each cluster

```
for j = 1:size(dspk,3)    % dspk.shape = time * channel * NUM of spikes
    % ---------- update the corresponding temporal-spatial template of cluster id(j) ----------
    % for each detected spike j
    % -> find the assigned cluster, id(j)
    % -> find the corresponding temporal-spatial template of cluster id(j), dWU(:,:,id(j))
    % -> find the temporal-spatial waveform of spike j in raw signal, dspk(:,:,j)
    % -> update the template using a param 'pm'
    %    with the batch num increases, pm increases from 0.9512 to 0.9975
    %    which means, in the later phase of the optimization, the
    %    reference of the waveforms of the new detected spikes becomes
    %    less important.
    dWU(:,:,id(j))  = pm * dWU(:,:,id(j)) + (1-pm) * dspk(:,:,j);

    % ---------- find amplitude needed by template id(j), to fit the raw waveform of spike j --
    x(j) = proj(st(j), id(j));
    % now we know, proj can be interpreted as the amplitude

    % ---------- find cost decrease when fitting the raw waveform of spike j with x(j)* dWU(:,:,id(j))
    Cost(j) = maX(st(j));
    % now we know Max is related to Cost

    % ---------- update the number of spikes for cluster id(j) ----------
    nsp(id(j))= nsp(id(j)) + 1;
end
```