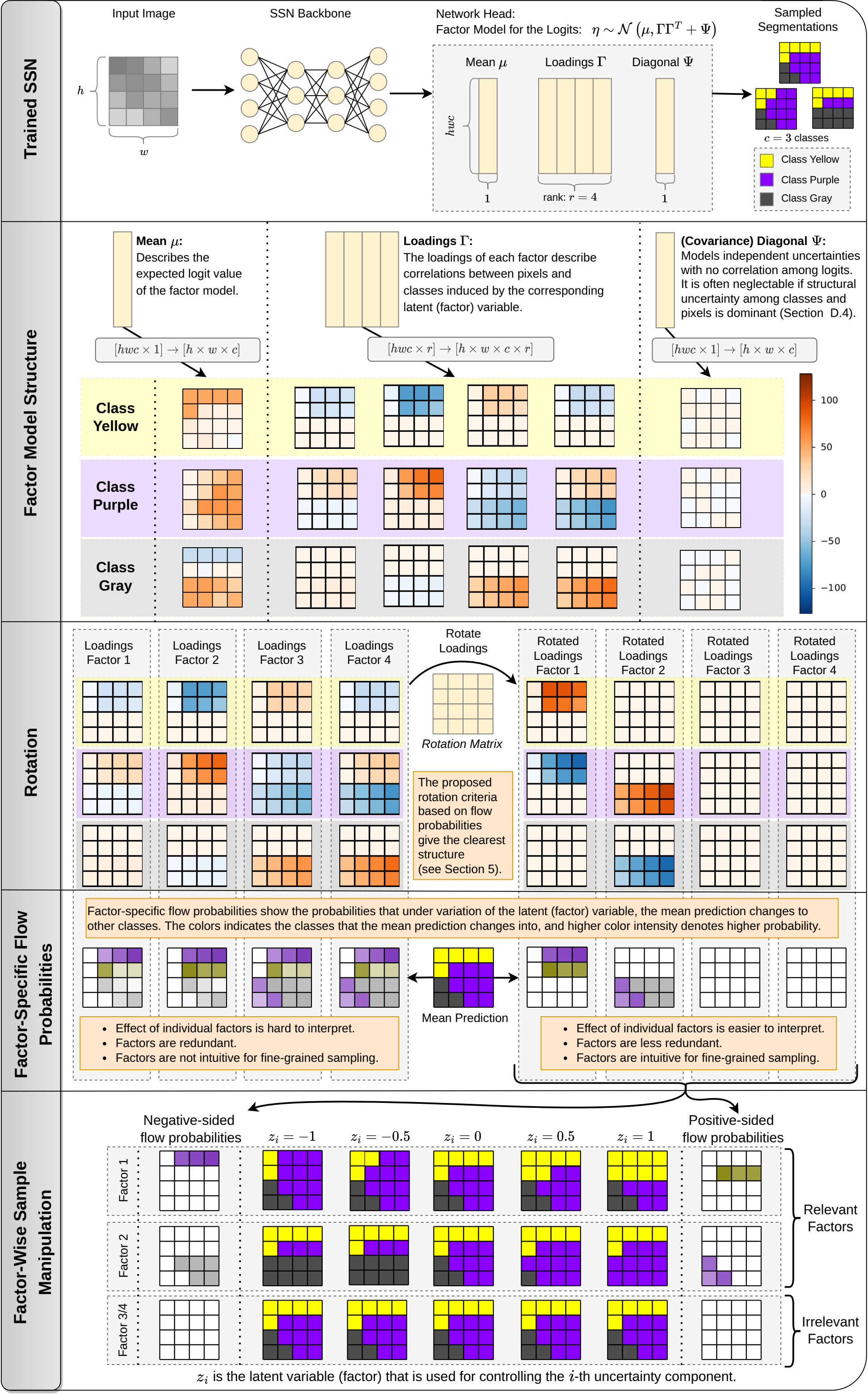
Trained SSN
Input Image
SSN Backbone
Network Head:
Factor Model for the Logits: $\eta \sim \mathcal{N}(\mu, \Gamma\Gamma^T + \Psi)$
Sampled Segmentations
h
w
Mean μ
Loadings Γ
Diagonal Ψ
hwc
1
rank: $r = 4$
1
$c = 3$ classes
Class Yellow
Class Purple
Class Gray
Factor Model Structure
Mean μ: Describes the expected logit value of the factor model.
Loadings Γ: The loadings of each factor describe correlations between pixels and classes induced by the corresponding latent (factor) variable.
(Covariance) Diagonal Ψ: Models independent uncertainties with no correlation among logits. It is often neglectable if structural uncertainty among classes and pixels is dominant (Section D.4).
$[hwc \times 1] \rightarrow [h \times w \times c]$
$[hwc \times r] \rightarrow [h \times w \times c \times r]$
$[hwc \times 1] \rightarrow [h \times w \times c]$
Class Yellow
Class Purple
Class Gray
100
50
0
−50
−100
Rotation
Loadings Factor 1
Loadings Factor 2
Loadings Factor 3
Loadings Factor 4
Rotate Loadings
Rotation Matrix
Rotated Loadings Factor 1
Rotated Loadings Factor 2
Rotated Loadings Factor 3
Rotated Loadings Factor 4
The proposed rotation criteria based on flow probabilities give the clearest structure (see Section 5).
Factor-Specific Flow Probabilities
Factor-specific flow probabilities show the probabilities that under variation of the latent (factor) variable, the mean prediction changes to other classes. The colors indicates the classes that the mean prediction changes into, and higher color intensity denotes higher probability.
Mean Prediction
• Effect of individual factors is hard to interpret.
• Factors are redundant.
• Factors are not intuitive for fine-grained sampling.
• Effect of individual factors is easier to interpret.
• Factors are less redundant.
• Factors are intuitive for fine-grained sampling.
Factor-Wise Sample Manipulation
Negative-sided flow probabilities
$z_i = -1$
$z_i = -0.5$
$z_i = 0$
$z_i = 0.5$
$z_i = 1$
Positive-sided flow probabilities
Factor 1
Factor 2
Factor 3/4
Relevant Factors
Irrelevant Factors
z_i is the latent variable (factor) that is used for controlling the i-th uncertainty component.