**ABSTRACT**

Propose a new learning-based tone mapping framework which
- relies on a regression-based approach to predict locally adaptive parameter-maps.
- results in tone-mapped images that are optimal for image matching under drastic lighting changes.

Introduce a mechanism to generate training samples using a similarly maximization approach.

Proposed model:
- evaluated against state-of-the-art TMOs using various descriptor extraction schemes.
- provides more stable matches in the images undergone drastic lighting variations in the "HDR dataset".

**PROPOSED FRAMEWORK**

**TMO Framework**
- Tone Mapping $I' = \phi(I, \theta)$ (1),
  where $\theta = \{\theta_1, \theta_2, ...\}$.

We demonstrate our model for Bilateral filtering based tone mapping where:
$$\phi = \gamma I.$$

**SGD based Optimization**:
$$\theta_{t+1} = \theta_t - \gamma_t \cdot \nabla \Phi(\theta_t)(\theta_t),$$

**Learning the Prediction Model**

Densely sample the key locations and extract SIFT feature.
Feed the SVR model with the features and corresponding ground truth and solve the following minimization problem:
$$\min_{w, \xi} \frac{1}{2} \|w\|^2 + C \sum_i (\xi_i + \xi_i^*)$$
subject to:
$$\alpha_i^+ - (\alpha_i^+ - \alpha_i^+ \psi(f_i + b) - \alpha_i^+ \leq \xi_i,$n_i \leq \xi_i.\alpha_i^+ \leq \xi_i.\alpha_i^+ = 0, i = 1, n.$$

**RESULTS & CONCLUSIONS**

Experimental Setup
- HDR dataset with 8 scenes with 6-7 lighting variations.
- State of the art TMOs: ChiuTMO, DragotTMO, ReinhardtTMO, MantiukTMO.
- Descriptor extraction schemes: SURF, SIFT, FREAK, BRISK.
- Epsilon-SVR used with RBF kernel and regularization cost and epsilon values tuned by 5-fold cross validation from the range [2^{-5}, 2^{15}] and [2^{-5}, 2^{15}].

- Day/Night matching using SURF.
- Row I: 2 scene invalidates scene.
- Row II: feature matching using our proposed DoTMO (11 correct and 3 incorrect matches).
- Row III: using Reinhardt TMO (3 correct and 11 incorrect matches).
- Row IV: using MantiukTMO (4 incorrect and 3 correct matches).