2020-02322 - PhD Position F/M Low light image enhancement with learning techniques

Type de contrat : CDI  
Niveau de diplôme exigé : Bac + 5 ou équivalent  
Fonction : Doctorant

A propos du centre ou de la direction fonctionnelle

The Inria Rennes - Bretagne Atlantique Centre is one of Inria’s eight centres and has more than thirty research teams. The Inria Center is a major and recognized player in the field of digital sciences. It is at the heart of a rich R&D and innovation ecosystem: highly innovative PMEs, large industrial groups, competitiveness clusters, research and higher education players, laboratories of excellence, technological research institute, etc.

Contexte et atouts du poste

In the context of a partnership between Inria and Airbus, Inria-Rennes Bretagne Atlantique is recruiting a PhD student with a background in image processing, computer vision, and machine learning. The expected duration of the PhD is 3 years. The start date is open (fall 2020).

Location. The PhD candidate will be based at INRIA Rennes, France, but he/she will have regular contacts with the partners at Airbus through meetings and collaborative work.

Mission confiée

Many image processing algorithms, e.g., for object detection, classification, segmentation, recognition, scene understanding and 3D reconstruction, have been designed for normal lighting conditions, and do not perform well in low light environments. These problems with poor lighting conditions (e.g. moonlight, hazing, short exposure) are challenging due to the lower number of photons, inducing very low contrast and noise. Due to the limited dynamic range of digital imaging devices, the recorded images can also be under or over-exposed with limited contrast.

The PhD will focus on the problem of low light image enhancement that implies handling various factors simultaneously including brightness, contrast, artifacts and noise. While early methods have been based on the retinex theory [1], assuming that observed images can be decomposed into the reflectance and illumination, in this thesis, we will instead consider this problem as a machine learning problem.

Deep neural networks have already been shown to be powerful tools for a number of inverse problems, e.g. super-resolution, dehazing, rain removal, and have recently been considered for low light image enhancement. A multi-branch fully convolutional neural network (MBLLEN) is proposed in [2] for low light image enhancement. A deep RetinexNet including a DecomNet for the decomposition of reflectance and illumination, and an EnhanceNet for illumination adjustment is introduced in [3]. The authors in [4] use an auto-encoder (LLNet) for simultaneous low-light enhancement and noise reduction. The level of noise is higher in dark regions and can be amplified by the enhancement process. A deep neural network is considered in [5] for the entire raw data processing pipeline including color transformations, demosaicing, noise reduction, and image enhancement.

The PhD will investigate deep learning methods for low light image enhancement, while considering elements of the Retinex theory, i.e. assuming that an image can be decomposed into a product of illumination and reflectance. One goal will be to propose a deep learning approach for separating these two components and study different regularization constraints (e.g. consistent reflectance, illumination smoothness, ...) for solving the low light image enhancement problem. Starting with neural networks learned from appropriately collected training data, the PhD may also consider learning from the input image itself in the same vein as the deep image prior [7] will be considered.

References


Informations générales

- Thème/Domaine : Vision, perception et interprétation multimedia
- Ville : Rennes
- Centre Inria : CRI Rennes - Bretagne Atlantique
- Date de prise de fonction souhaitée : 2020-10-01
- Durée de contrat : 3 ans
- Date limite pour postuler : 2020-03-31

Contacts

- Equipe Inria : SIROCCO
- Directeur de thèse : Guillerot Christine  
  christine.guillerot@inria.fr

A propos d’Inria

Inria is the national institute of research dedicated to sciences and technologies of the digital. It employs 2600 people. Its 200 projects and 8 centres are in general associated with more than 3500 scientific partners to research the definitions of the digital, and is participated by the partners from different disciplines. The institute has an important role in the research of entrepreneurs who impact the world. Inria works with numerous companies and contributes to the creation of more than 180 start-ups. Inria aims to attract the highest talents in the field of science, the society and the economy.

L’essentiel pour réussir

Candidate profile The candidate should have strong background in image processing, computer vision, and machine learning.

Consignes pour postuler

Please submit online : your resume, cover letter and letters of recommendation eventually

For more information, please contact aline.roumy@inria.fr

Sécurité défense : Ce poste est susceptible d’être affecté dans une zone à régime restrictif (ZRR), telle que définie dans le décret n°2011-425 relatif à la protection du potentiel scientifique et technique de la nation (PPST). L’autorisation d’accès à une zone est délivrée par le chef d’établissement, après avis ministériel favorable, tel que défini dans l’arrêté du 03 juillet 2012, relatif à la PPST. Un avis ministériel défavorable pour un poste affecté dans une ZRR aurait pour conséquence l’annulation du traitement de candidature.

Politique de recrutement : Dans le cadre de sa politique diversité, tous les postes Inria sont accessibles aux personnes en situation de handicap.

Attention : Les candidatures doivent être déposées en ligne sur le site Inria.

Le traitement des candidatures adressées par d'autres canaux n’est pas garanti.

Principales activités

How to apply Each application should consist of

- a CV,  
- a letter of introduction  
- a copy of the student’s university transcripts.  
(PDF format would be appreciated).

In the letter, the applicant should include the following details:

- An explanation of his/her interest in the research we conduct and why he/she believes

For more information, please contact aline.roumy@inria.fr
Applications should be submitted by email to Christine.Guillemot@inria.fr and Aline.Roumy@inria.fr with the subject line "PhD Low light image enhancement with learning techniques".

**Avantages**
- Subsidized meals
- Partial reimbursement of public transport costs
- Professional equipment available (videoconferencing, loan of computer equipment, etc.)
- Social, cultural and sports events and activities
- Access to vocational training
- Social security coverage

**Rémunération**
Monthly gross salary amounting to 1982 euros for the first and second years and 2085 euros for the third year