Traitement d'images
Image Processing

Cadrage des Projets
Organisation of the projects

DANIEL RACOCEANU

PROFESSEUR, SORBONNE UNIVERSITÉ

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Projects

Objectives : study of a state of the art image processing method

The work is to be done alone or in pairs.

The defenses will take place during the exam week (see course n°1 for the deadline).

Submission of deliverables : abstract (3-5 pages) – try to use latex / overleaf for a clean document,

slides (9-10 pages) and code: see course n°1 for deadline

The defense will last 10 minutes per project (even if done in binome, for both : publication and challenge)

Demo of the proposed method, suitable (preferably in Python).

Two types of project topics are possible:
Challenge in biomedical imaging, robotics, space, autonomous vehicles etc. (+2p)
Potential sources:
- https://grand-challenge.org/
- http://www.miccai.org/special-interest-groups/challenges/miccai-registered-challenges/
- https://www.kaggle.com/datasets
- https://www.kaggle.com/competitions

Recent publication in the field of image processing, with high impact (high number of citations)
part of the proposed list (on Moodle) or proposed by you (and validated by the head of the UE).

Choice of subject : see course n°1 for the deadline

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Projets

Objectifs : étude d'une méthode de traitement de l'image à l'état de l'art

Le travail est à réaliser seul ou en binôme.
Les soutenances auront lieu en semaine d'examen (voir cours n°1 pour la date limite).

Soumission des livrables : résumé 3-5 pages (conseil : essayez avec latex / overleaf), diapos (9-10 pages), et

code - voir cours n°1 pour la date limite

La soutenance durera 10 minutes en total, par projet (monôme ou binôme, papier ou challenge)

Démo de la méthode proposée, souhaitée (de préférence en Python).

Deux type de sujets de projet sont possibles :

A. Challenge en imagerie biomédicale, robotique, spatial, véhicules autonomes etc. (+2p)
   Sources potentielles :
   - https://grand-challenge.org/
   - http://www.miccai.org/special-interest-groups/challenges/miccai-registered-challenges/
   - https://www.kaggle.com/datasets
   - https://www.kaggle.com/competitions
B. Publication récente du domaine du traitement de l'image, à fort impact (nombre élevé de citations) faisant partie de la liste proposée (sur Moodle) ou proposée par vous (et validée par le responsable de l'UE).

Choix du sujet : voir cours n°1 pour la date limite

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Project deliverables and structure of the slides

Deliverables:

1. slides (9-10 pages),
2. code (Python)
3. short abstract of the work (3-5 pages)

Standard structure of the presentation slides (Power Point) - 9-10 slides

- review of recent existing methods (min. 5 articles less than 10 years old)
- critical and personal analysis of these methods (advantages, disadvantages, weaknesses, strengths)
- suggestion of a new or recent method (publication less than 5 years old)
- development of the algorithm
- implementation of the method (prototyping)
- testing of the method on a database
- conclusions
- perspectives
- bibliography / references

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Livrables du projet et structure de la présentation

Livrables :

1. Diapositives (9-10 pages),
2. Code (Python)
3. Court résumé du travail (3-5 pages)

Structure-type des diapositives de présentation du projet (Power Point) – 9-10 diapositives

- passage en revue des méthodes récentes existantes (min 5 articles datant de moins de 10 ans)
- analyse critique et personnelle de ces méthodes (avantages, désavantages, points faibles, points forts)
- suggestion d'une méthode nouvelle ou récente (publication datant de moins de 5 ans)
- élaboration de l'algorithme
- mise en œuvre de la méthode (prototypage)
- test de la méthode sur une base de donnée
- conclusions
- perspectives
- liste bibliographique

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Articles suggérés
Suggested articles

DANIEL RACOCEANU

PROFESSEUR, SORBONNE UNIVERSITÉ

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Sujets proposes

(Articles à fort impact - Level Sets)

1. **A level set method for structural topology optimization**
   MY Wang, X Wang, D Guo - Computer methods in applied mechanics and engineering, 2003 Elsevier
   https://www.sciencedirect.com/science/article/pii/S0045782502005595
2. **A Fast Level Set Method for Propagating Interfaces**
   D Adalsteinsson, JA Sethian - J. Comput. Phys, 1994
   https://pdfs.semanticscholar.org/08fa/6b53aeb9490f0a4c86d6b8eba9ba89d540d8.pdf
3. **Level set evolution without re-initialization: a new variational formulation**
   C Li, C Xu, C Gui, MD Fox - Computer Vision and Pattern Recognition Conference (CVPR), 2005
   https://www.ljll.math.upmc.fr/~frey/papers/levelsets/Li%20C.,%20Level%20set%20evolution%20without%20re-initialization.pdf
4. **Shape modeling with front propagation: A level set approach**
   R Malladi, JA Sethian, BC Vemuri - IEEE Transactions on Pattern Analysis and Machine Intelligence (PAMI), 1995
   https://math.berkeley.edu/~sethian/2006/Papers/sethianmalladivemuritopologyindependent1993.pdf
5. **A PDE-based fast local level set method**
   D Peng, B Merriman, S Osher, H Zhao, Myungjoo Kang - Journal of Computational Physics 155, 410–438 (1999) Elsevier
   https://pdfs.semanticscholar.org/7678/1ac07285b834d0ec05b71e77874477dc6fdd.pdf?_ga=2.205772113.393542260.1582903488-514853286.1582309325
6. **A fast marching level set method for monotonically advancing fronts**
   JA Sethian - 1996 - National Acad Sciences
   http://ugweb.cs.ualberta.ca/~vis/courses/CompVis/readings/modelrec/sethian95fastlev.pdf

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Sujets proposes

(Articles à fort impact - Level Sets)

7. **Shape priors for level set representations**
   M Rousson, N Paragios - European Conference on Computer Vision (ECCV), 2002 – Springer
   https://www.researchgate.net/publication/221304637_Shape_Priors_for_Level_Set_Representations
8. **Structural boundary design via level set and immersed interface methods**
   JA Sethian, A Wiegmann - Journal of computational physics, 2000 – Elsevier
   https://math.berkeley.edu/~sethian/2006/Papers/sethian.optimal_design.pdf
9. **A hybrid particle level set method for improved interface capturing**
   D Enright, R Fedkiw, J Ferziger, I Mitchell - Journal of Computational Physics, 2002 – Elsevier
   http://physbam.stanford.edu/~fedkiw/papers/stanford2001-04.pdf
10. **Level set methods for fluid interfaces**
    JA Sethian, P Smereka - Annual review of fluid mechanics, 2003 - annualreviews.org
    https://www.ljll.math.upmc.fr/frey/ftp/M5105/Sethian%20J.S.,%20Smereka%20P.,%20Level%20set%20methods%20for%20fluid%20interfaces.pdf
11. **A multiphase level set framework for image segmentation using the Mumford and Shah model**
    LA Vese, TF Chan - International journal of computer vision, 2002 – Springer
    https://www.math.ucla.edu/~lvese/PAPERS/IJCV2002.pdf
12. **Distance regularized level set evolution and its application to image segmentation**
    C Li, C Xu, C Gui, MD Fox - IEEE transactions on image processing (TIP), 2010
    http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.231.9150&rep=rep1&type=pdf

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Sujets proposes

(Articles à fort impact - Active Contours)

13. **Snakes: Active contour models**
    M Kass, A Witkin, D Terzopoulos - International journal of computer vision, 1988 – Springer
    http://www.cs.ait.ac.th/~mdailey/cvreadings/Kass-Snakes.pdf

14. **On active contour models and balloons**
    LD Cohen - CVGIP: Image understanding, 1991 – Elsevier
    https://www.ceremade.dauphine.fr/~cohen/mypapers/cohenCVGIP91.pdf

15. **Fast global minimization of the active contour/snake model**
    X Bresson, S Esedoğlu, P Vandergheynst… - Journal of Mathematical Imaging and Vision, 2007 – Springer
    http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.190.5850&rep=rep1&type=pdf

16. **An active contour model without edges**
    T Chan, L Vese - IEEE Transaction on Image Processing, 2001
    https://www.math.ucla.edu/~lvese/PAPERS/IEEEIP2001.pdf

17. **Gradient flows and geometric active contour models**
    S Kichenassamy, A Kumar, P Olver… - Proceedings of IEEE …, 1995
    https://www.researchgate.net/publication/3612988_Gradient_flows_and_geometric_active_contour_models

18. **Region-based strategies for active contour models**
    Remi Ronfard, International Journal of Computer Vision, 1994
    https://www.researchgate.net/publication/220660367_Region-Based_Strategies_for_Active_Contour_Models

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Sujets proposes

(Articles à fort impact - Active Contours)

19. **User-guided 3D active contour segmentation of anatomical structures: significantly improved efficiency and reliability**
    F Leymarie, MD Levine - IEEE Transactions on Pattern Analysis …, 1993
    http://midag.cs.unc.edu/pubs/papers/Neuroimage06_Yushkevich.pdf

20. **Tracking deformable objects in the plane using an active contour model**
    F Leymarie, MD Levine - IEEE Transactions on Pattern Analysis and Machine Intelligence, 1993
    https://www.researchgate.net/publication/3192152_Tracking_Deformable_Objects_in_the_Plane_Using_an_Active_Contour_Model

21. **Global minimum for active contour models: A minimal path approach**
    LD Cohen, R Kimmel - International journal of computer vision, 1997 – Springer
    https://www.ceremade.dauphine.fr/~cohen/mypapers/kimmelIJCV97.pdf

22. **An active contour model for mapping the cortex**
    CA Davatzikos, JL Prince - IEEE Transactions on Medical Imaging (TMI), 1995
    https://pdfs.semanticscholar.org/dcdc/b511b8158c9e4d9e1cbaab5c7fa08037870b.pdf?_ga=2.135368369.1885662100.1583168923-514853286.1582309325

23. **Finite-element methods for active contour models and balloons for 2-D and 3-D images**
    LD Cohen, I Cohen - IEEE Transactions on Pattern Analysis and Machine Intelligence (PAMI), 1993
    http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.8.7368&rep=rep1&type=pdf

24. **A multiple active contour model for cardiac boundary detection on echocardiographic sequences**
    V Chalana, DT Linker, DR Haynor… - IEEE Transactions on Medical Imaging (TMI), 1996

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Sujets proposes

(Articles à fort impact - Fractales)

25. **Segmentation of textured images based on fractals and image filtering**
T Kasparis, D Charalampidis, M Georgiopoulos… - Pattern Recognition, 2001 - Elsevier

26. **Stochastic fractal models for image processing**
B Pesquet-Popescu, JL Véhel - IEEE Signal Processing …, 2002 - ieeexplore.ieee.org

27. **Image encryption method using a class of fractals**
C Alexopoulos, NG Bourbakis… - Journal of Electronic …, 1995 - spiedigitallibrary.org

28. **Multi-scale fractal analysis of image texture and pattern**
CW Emerson - 1998 - ntrs.nasa.gov

29. **Fractal image denoising**
M Ghazel, GH Freeman… - … Transactions on image …, 2003 - ieeexplore.ieee.org

30. **Image segmentation and contour detection using fractal coding**
T Ida, Y Sambonsugi - … transactions on circuits and systems for …, 1998 - ieeexplore.ieee.org

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Sujets proposes

(Articles à fort impact - Ondelettes)

31. **Image representation using 2D Gabor wavelets**
TS Lee - IEEE Transactions on pattern analysis and machine …, 1996 - ieeexplore.ieee.org

32. **Performance analysis of image compression using wavelets**
S Grgic, M Grgic, B Zovko-Cihlar - IEEE Transactions on …, 2001 - ieeexplore.ieee.org

33. **Nonlinear wavelet image processing: variational problems, compression, and noise removal through wavelet shrinkage**
A Chambolle, RA De Vore, NY Lee… - … Transactions on Image …, 1998 - ieeexplore.ieee.org

34. **Line-based, reduced memory, wavelet image compression**
C Chrysafis, A Ortega - IEEE Transactions on Image …, 2000 - ieeexplore.ieee.org

35. **Space-frequency quantization for wavelet image coding**
Z Xiong, K Ramchandran… - … Transactions on Image …, 1997 - ieeexplore.ieee.org

36. **A tutorial on modern lossy wavelet image compression: foundations of JPEG 2000**
BE Usevitch - IEEE signal processing magazine, 2001 - ieeexplore.ieee.org

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(Articles à fort impact – Transformés de Fourier)

37. Image rotation, Wigner rotation, and the fractional Fourier transform
AW Lohmann - JOSA A, 1993 - osapublishing.org

38. Shape-based image retrieval using generic Fourier descriptor
D Zhang, G Lu - Signal Processing: Image Communication, 2002 - Elsevier

39. Generic Fourier descriptor for shape-based image retrieval
D Zhang, G Lu - Proceedings. IEEE International Conference …, 2002 - ieeexplore.ieee.org

40. Rotation invariant image description with local binary pattern histogram fourier features
T Ahonen, J Matas, C He, M Pietikäinen - … conference on image analysis, 2009 – Springer

41. Fourier coding of image boundaries
R Chellappa, R Bagdazian - IEEE Transactions on Pattern …, 1984 - ieeexplore.ieee.org

42. Color image watermarking using quaternion Fourier transform
P Bas, N Le Bihan, JM Chassery - 2003 IEEE International …, 2003 - ieeexplore.ieee.org

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Sujets proposes

(Articles à fort impact – Transformés de Fourier)

43. Panoptic Segmentation
Alexander Kirillov, Kaiming He … : https://arxiv.org/abs/1801.00868

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