Spatial Semantic-Preserving Latent Space Learning for Accelerated DWI Diagnostic Report Generation

EPSRC Centre for Doctoral Training

Smart Medical Imaging

EPSRC Engineering and Physical Sciences Research Council



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Introduction

Brain DWI (diffusion-weighted imaging)









Problem Formulation



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Problem Formulation





Text Report Generation







Proposed Methodology



Text report generator (uses latent embedding to generate reports)



Proposed Methodology



(generates latent embedding)

Text report generator (uses latent embedding to generate reports)

Dataset





Results



True text report: Small acute white matter infarct left corona radiata

Acceleration Rate: None/x1



ground truth

undersampling mask



accelerated image

Text Report Generated

Small area acute infarct left corona radiata



Results

True text report: Small acute white matter infarct left corona radiata

Acceleration Rate: None/x1



ground truth



undersampling mask



accelerated image

Text Report Generated

Small area acute infarct left corona radiata



| | B1 | B2 | B 3 | B4 |
|------------|------|------|------------|------|
| Sampl e | 81.5 | 77.5 | 76.2 | 73.3 |
| Avg | 38.1 | 27.3 | 20.3 | 15.6 |



Results

True text report: Small acute white matter infarct left corona radiata

Acceleration Rate: x2



ground truth



undersampling mask



accelerated image



| | B1 | B2 | B 3 | B4 |
|------------|------|------|------------|------|
| Sampl e | 75.4 | 59.4 | 49.4 | 36.9 |
| Avg | 34.1 | 23.3 | 15.6 | 11.6 |

Text Report Generated

Small area restricted diffusion within left mca territory infarct



Results

True text report: Small acute white matter infarct left corona radiata

Acceleration Rate: x4



ground truth



undersampling mask



accelerated image

Text Report Generated

Focal area signal within left corona radiata



| | B1 | B2 | B3 | B4 |
|------------|------|------|------|------|
| Sampl e | 75.8 | 63.0 | 55.5 | 47.7 |
| Avg | 31.4 | 19.4 | 12.3 | 8.3 |



Results

True text report: Small acute white matter infarct left corona radiata

Acceleration Rate: x8



ground truth



undersampling mask



accelerated image

Text Report Generated

Multiple small foci acute ischaemia left gyrus



| | B1 | B2 | B3 | B4 |
|------------|------|------|------|------|
| Sampl e | 66.8 | 51.0 | 44.0 | 34.3 |
| Avg | 21.3 | 10.4 | 5.1 | 2.6 |



Results

True text report: Small acute white matter infarct left corona radiata

Acceleration Rate: x64



ground truth



undersampling mask



accelerated image



| | B1 | B2 | B3 | B4 |
|------------|------|------|-----------|------|
| Sampl e | 59.0 | 46.5 | 40.9 | 32.2 |
| Avg | 21.6 | 11.1 | 5.0 | 2.4 |

Text Report Generated

area restricted diffusion accompanying flair within left corona radiata suggest ...



Conclusion







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