

Computational Statistics

Hyperspherical VAE

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Presentation date>



**Lorem
ipsum**

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2. Sampling method
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5. Conclusion and Discussion



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introduire la méthode et les contributions [DFDC⁺]



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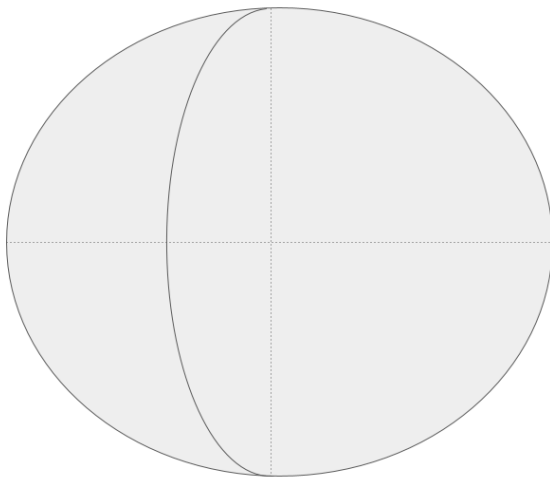
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Démontrer que la méthode de sampling marche



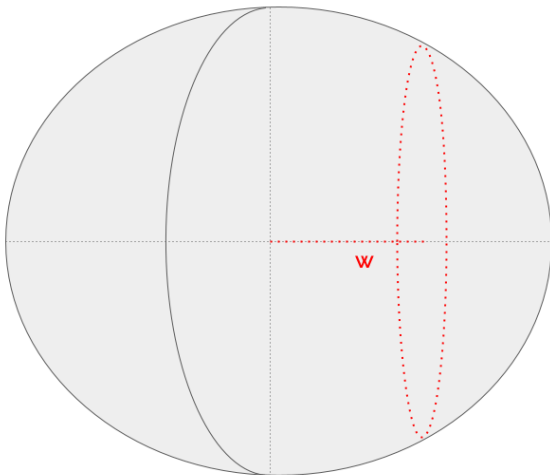
Sampling w from $g(w|\kappa, \theta)$



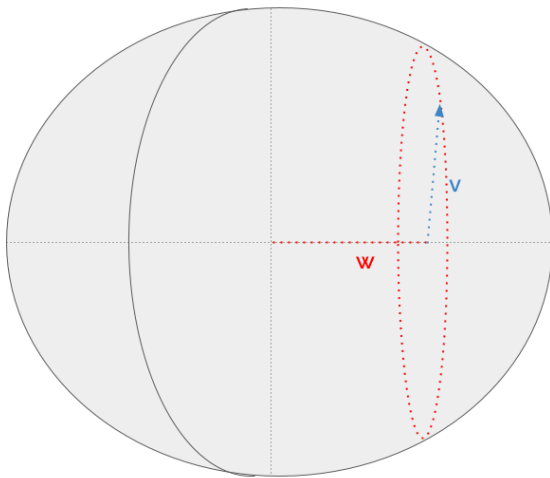
S^2 : unit sphere in \mathbb{R}^3



Sampling w



Sampling w



Sampling w

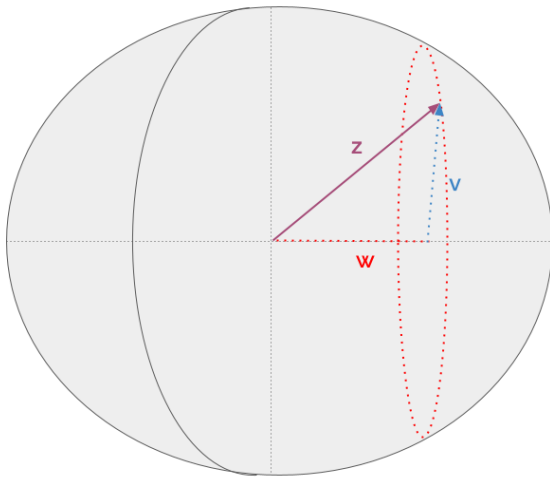


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The authors use a reparameterization trick that has been extended to distributions that can be sampled using rejection sampling [NRLB20].

Algorithm 1 Reparameterized Rejection Sampling (from [NRLB20])

```
1:  $i \leftarrow 0$ 
2: repeat
3:    $i \leftarrow i + 1$ 
4:   Propose  $\varepsilon_i \sim s(\varepsilon)$ 
5:   Simulate  $u_i \sim \mathcal{U}[0, 1]$ 
6: until  $u_i < \frac{g(h(\varepsilon_i, \theta); \theta)}{r(h(\varepsilon_i, \theta); \theta)}$ 
7: return  $\varepsilon_i$ 
```



By noting $\pi(\varepsilon|\theta)$ the distribution of the resulting ε , we have

$$\nabla_{\theta} \mathbb{E}_{g(\varepsilon|\theta)}[\dots] = \mathbb{E}_{\pi(\varepsilon|\theta)}[\dots] = \mathbb{E}_{(\varepsilon_i, U_i)_i}[\dots]$$

Problem: $(\varepsilon_i, U_i)_{i \in \mathbb{N}}$ is not a random variable (it is a stochastic process)
No reference to a convergence proof in [DFDC⁺, NRLB20, PBJ12, MG14]



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Experiments on link prediction

reproduire l'experience

- data (Ines)
- implementer les modèles (Victor VGAE)
- entraînement et evaluation







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Limitations à la fin : discussion sur la grande dimension
vanishing surface problem
vérifier différentes dimension de l'espace latent
et algo vraiment utile en petite ou moyenne dimension ?



-  Tim R. Davidson, Luca Falorsi, Nicola De Cao, Thomas Kipf, and Jakub M. Tomczak.
Hyperspherical variational auto-encoders.
-  Andriy Mnih and Karol Gregor.
Neural variational inference and learning in belief networks, 2014.
-  Christian A. Naesseth, Francisco J. R. Ruiz, Scott W. Linderman, and David M. Blei.
Reparameterization gradients through acceptance-rejection sampling algorithms, 2020.
-  John Paisley, David Blei, and Michael Jordan.
Variational bayesian inference with stochastic search, 2012.

