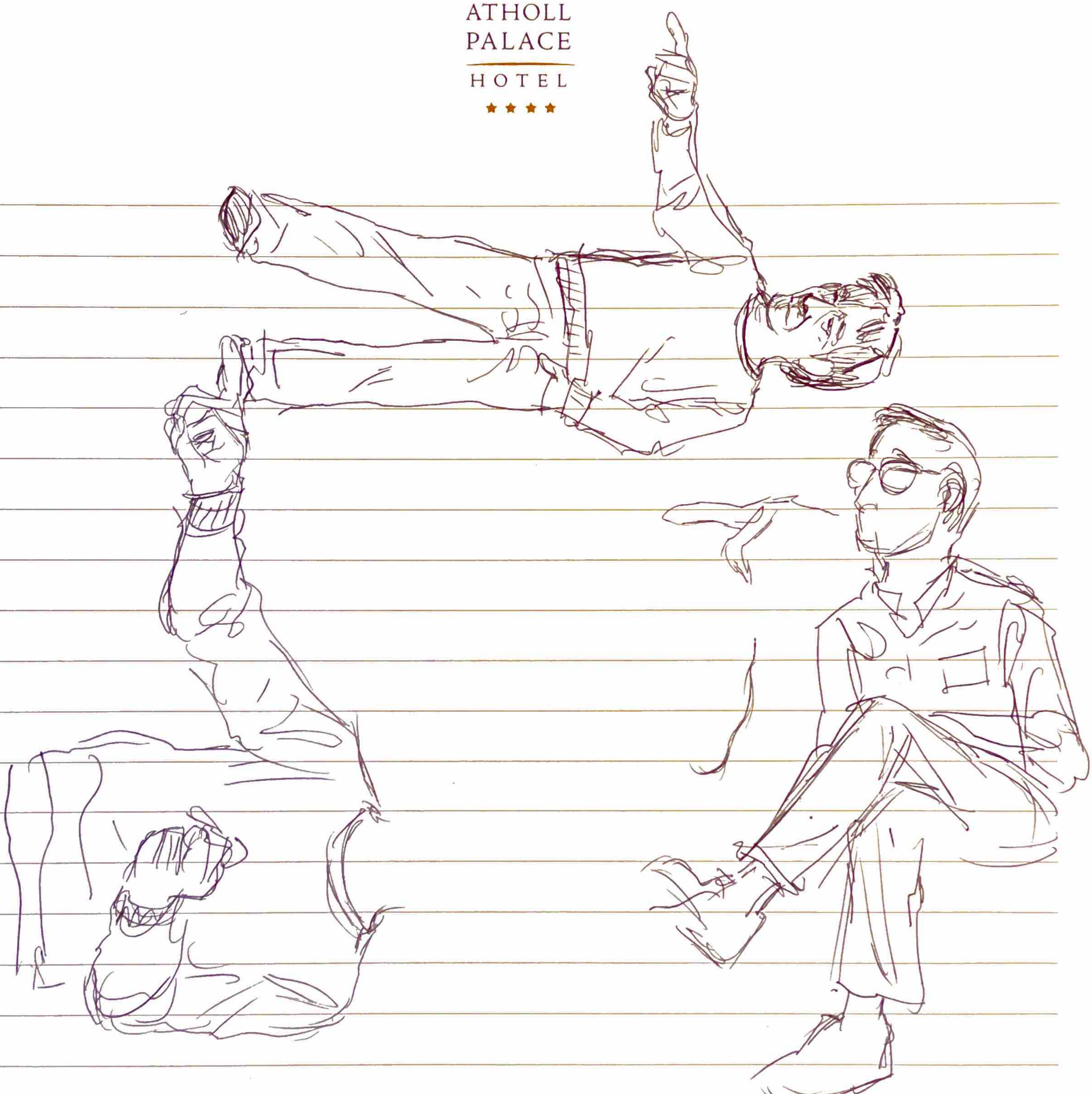
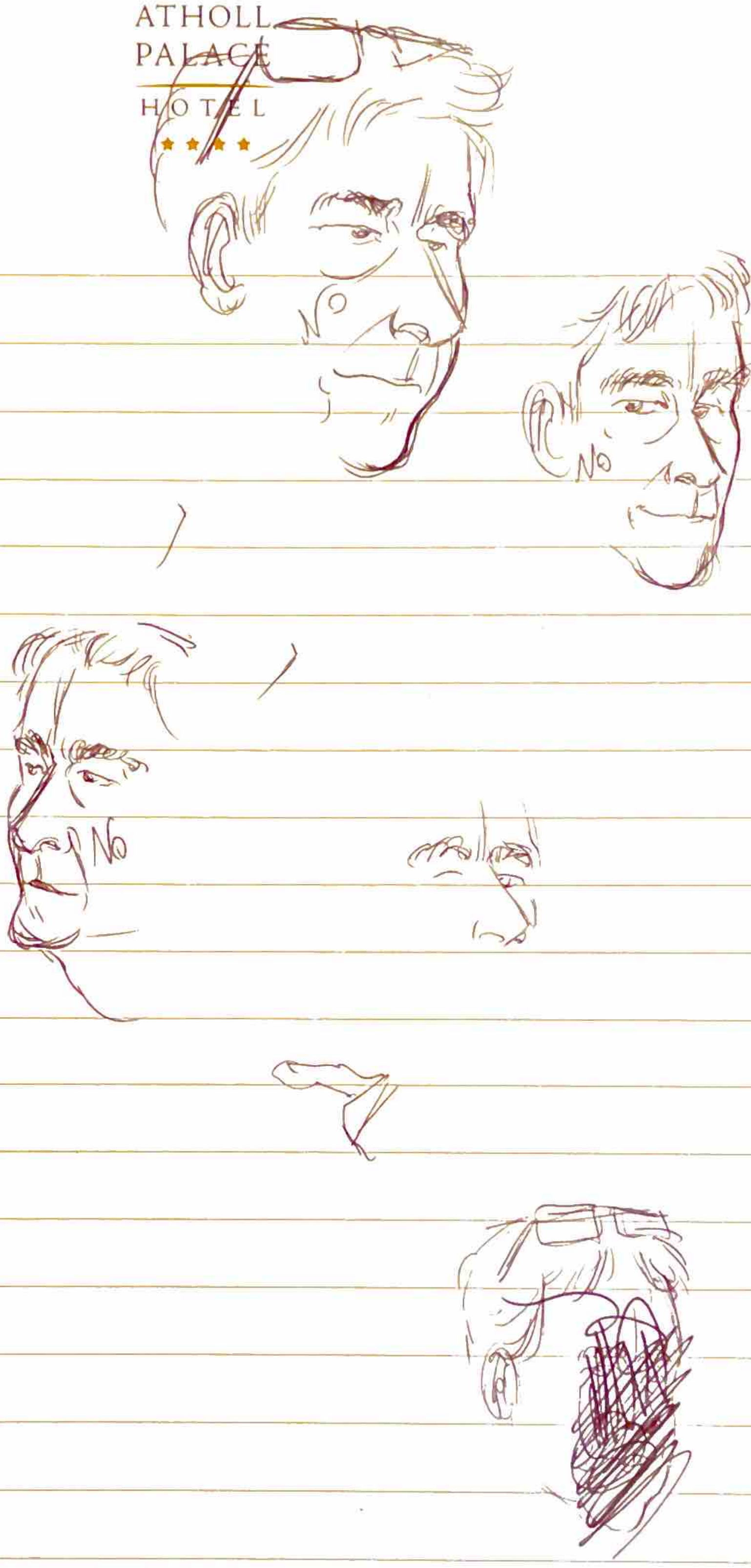
ATHOLL
PALACE
HOTEL

Pitlochry, Perthshire, PH16 5LX Scotland
WWW.ATHOLLPALACE.COM

ATHOLL PALACE HOTEL



ATHOLL PALACE HOTEL



Pitlochry, Perthshire, PH16 5LX Scotland
WWW.ATHOLLPALACE.COM

Bayesian solution $p(m|d) = \frac{p(d|m)p(m)}{p(d)}$

1. take semi-analytic functions and fit it
2. generate a set of samples of $p(m|d)$ by optimization

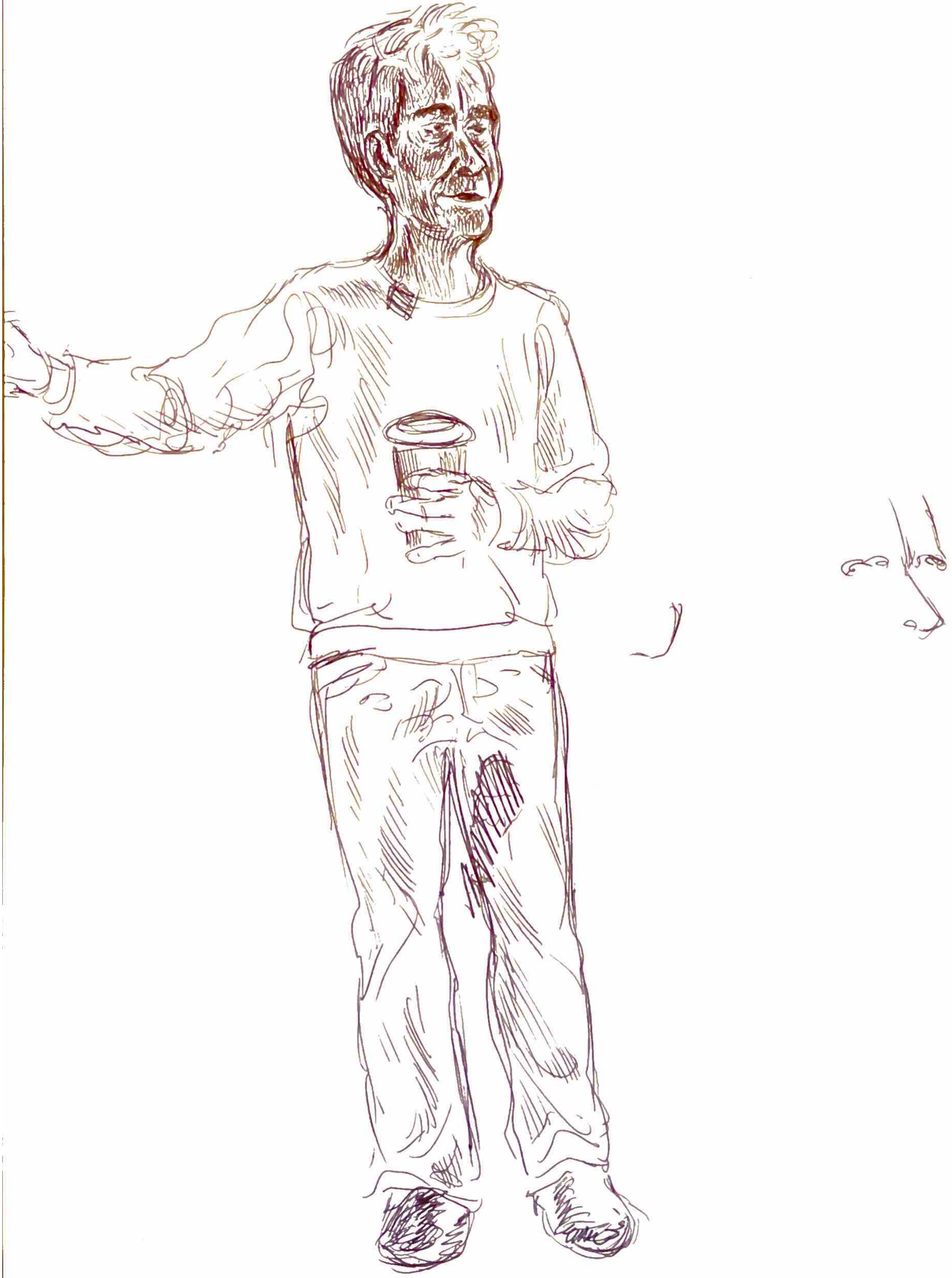
Kullback-Leibler divergence

$KL[q||p] = E_{q(m)}[\log q(m|\phi)] - E_{q(m)}[\log p(m|d)] + \log p(d)$

ATHOLL
PALACE
HOTEL
★★★★

Pitlochry, Perthshire, PH16 5LX Scotland
WWW.ATHOLLPALACE.COM


$d_{obs} = G(m) + \varepsilon$



ATHOLL
PALACE
HOTEL
★★★★

Pitlochry, Perthshire, PH16 5LX Scotland
WWW.ATHOLLPALACE.COM

Derivation of discrete adjoints – Adjoint method

$$\chi[\underline{u}(\underline{m})], \quad \frac{\partial\chi}{\partial m_i} = \partial_i\chi = \frac{\partial\chi^T}{\partial\underline{u}}\partial_i\underline{u} = \nabla\chi^T\partial_i\underline{u}$$

$$\underline{\underline{L}}(\underline{m})\,\underline{u} = \underline{f} \Longrightarrow \partial_i\underline{\underline{L}}\,\underline{u} + \underline{\underline{L}}\,\partial_i\underline{u} = \phi$$

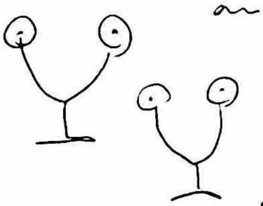
differentiate.

product rule

// we multiply the eq. per $\underline{V}^T$

matrix depend on model param

$\underline{f}$ are the sources and are independent of the earth model params



$$\left[\underline{V}^T\underline{\underline{L}} + \nabla\chi^T\right]\partial_i\underline{u}$$

$$\underline{V}^T\partial_i\underline{\underline{L}}\,\underline{u} + \underline{V}^T\underline{\underline{L}}\,\partial_i\underline{u} + \nabla\chi^T\partial_i\underline{u} = \partial_i\chi$$

$$\underline{\underline{L}}^T\underline{V} = -\nabla\chi \rightarrow \partial_i\chi = \underline{V}^T\partial_i\underline{\underline{L}}\,\underline{u}$$

adjoint eq.

$\underline{V}$ = adjoint field

Descent direction

$$\chi(\underline{m}_1) - \chi(\underline{m}_0) < \emptyset$$

$$\lim_{\gamma \to 0} \frac{1}{\gamma}\left[\chi(\underline{m}_0 - \gamma \underline{h}) - \chi(\underline{m}_0)\right] < \emptyset$$

$$\rightarrow \boxed{-\underline{h}^T \nabla \chi < 0}$$ descent direction

any vector $\underline{h}$ that satisfy this eq. is the descent direction

χ

$$\underline{h} = -\nabla \chi \Rightarrow -\chi^T \nabla \chi = -|\nabla \chi|^2 < 0$$

$$\underline{h} = -\underline{\underline{A}} \nabla \chi \Rightarrow \underbrace{-\Big(\underbrace{(\nabla \chi)^T \underline{\underline{A}} \nabla \chi}_{\text{always} > \emptyset}\Big)}_{< \emptyset}$$

$\underline{\underline{A}}$: only positive eigenvalues

you have infinite descent directions

$$\underline{h} = -\underline{\underline{A}} \nabla \chi$$ } you can use whichever $\underline{\underline{A}}$

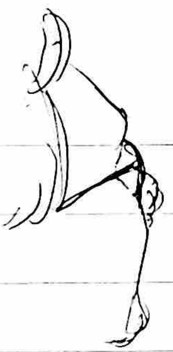
ATHOLL
PALACE
HOTEL
★ ★ ★ ★

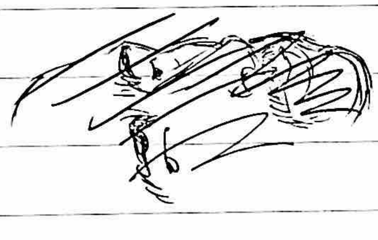
Pitlochry, Perthshire, PH16 5LX Scotland
WWW.ATHOLLPALACE.COM

ATHOLL
PALACE
HOTEL
★★★★

Multi-layer perception
Lawrence theory
for Atholl Palace
in Generalization capability
if you training

Dear all,





Pitlochry, Perthshire, PH16 5LX Scotland
WWW.ATHOLLPALACE.COM