

An Integrative Network Approach to Social Anxiety Disorder:

The Complex Dynamic Interplay among
Attentional Bias for Threat, Attentional Control,
and Symptoms

Alexandre Heeren^{a,b} & Richard J. McNally^b

^a Laboratory for Experimental Psychopathology, Université catholique de Louvain, Louvain-la-Neuve, Belgium

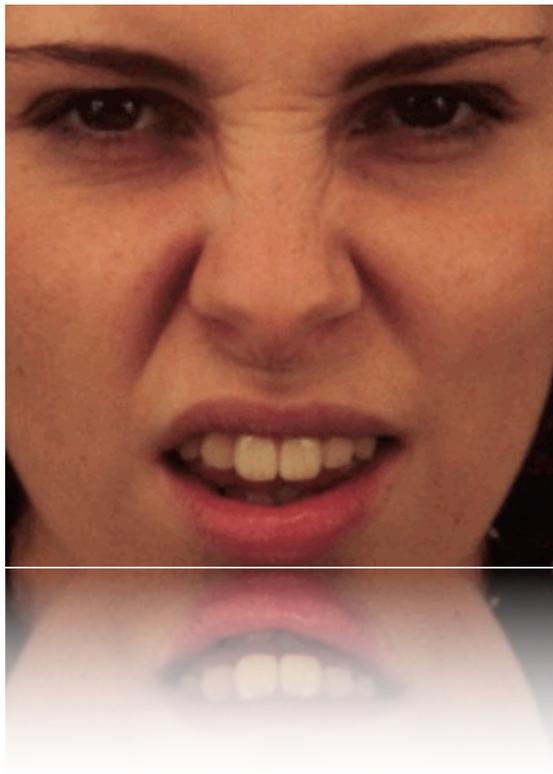
^b Department of Psychology, Harvard University, Cambridge, MA, USA

Introduction

Social anxiety disorder (SAD) is associated with and maintained by AB for threat (e.g., Heimberg et al., 2010).

Individuals with SAD respond faster to probes replacing social threat (for a meta-analysis, see Bantini et al., 2016)

Reducing AB via ABM may yield clinical benefits (for a meta-analysis, see Heeren et al., 2015)



Humiliation

Introduction

Despite increasing research linking AB and SAD symptoms, there are several limitations

- **No correlation between AB and severity of symptoms** (e.g., Ononaiye et al., 2007; Taylor et al., 2016).
- **Facilitated attentional engagement with social threat** (e.g., Grafton & MacLeod, 2006; Klumpp & Amir, 2010) *versus* **impaired attentional disengagement from them** (e.g., Amir et al., 2003; Buckner, 2010; Taylor et al., 2010). Yet it remains unclear how these biases interact between them and with core symptoms of SAD i.e. fear and avoidance.
- AB may result from **impaired attention control (AC)**. Yet, AC is a multifaceted construct (e.g., Petersen & Posner, 2012), including at least three components: alerting, orienting, and an executive component. However, most of the studies in the field of AB have treated AC as unitary construct.

Objectives



Uncertainty still abounds regarding both the relative importance and the mutual interactions of these different processes and SAD symptoms.

To clarify the dynamics among AB components, the three components of AC, and the core symptoms of SAD (fear and avoidance of social situations as well as reactivity to a social evaluative challenge), we applied network analytic methods.

Method

Participants

61 patients with DSM-IV criteria of Social Anxiety Disorder (from Heeren et al., 2015 - *Journal of Anxiety Disorders*)

70% women - Mean age = 26 ($SD = 9.17$)

Measures

Symptoms measures of SAD

- ***Liebowitz Social Anxiety Scale*** (LSAS; Liebowitz, 1987) - Fear and avoidance
- ***Impromptu speech task in front of a video camera***
 - Subjective Units of Discomfort Scale (SUDS; Wolpe, 1958)

Level of situational anxiety from 0 (not anxious) to 100 (extremely anxious)

- ***Behavioral Assessment of Speech Anxiety*** (BASA; Mulac & Sherman, 1974)

Two clinical psychologists rated their behaviors (e.g., having a clear voice, searching for the words) (intra-class correlation coefficient = .74).

Method

Measure of AB

- *Modified Spatial Cueing Task* (Amir et al., 2003; Heeren et al., 2011).
- Assessing distinctively both « *difficulty disengaging from threat* » and « *engagement with threat* »
- Social threat words (e.g., stupid, rejection) and neutral words (e.g., book, spoon), matched on frequency of usage in French
- The threat and neutral words did not differ in length, $t(14)=0.44$, $p>.66$, $d=0.23$

Measure of Attention Control

- *Attention Network task* (ANT; Fan, McCandliss, Sommer, Raz, & Posner, 2002)
- Three independent attentional components: *Alerting*, *Orienting*, and *Executive Control*
- *Alerting & Orienting*: Greater scores indicate greater efficiency - *Executive control*: greater score indicates increased difficulty with executive control.

Data analysis

Network estimation and visualization

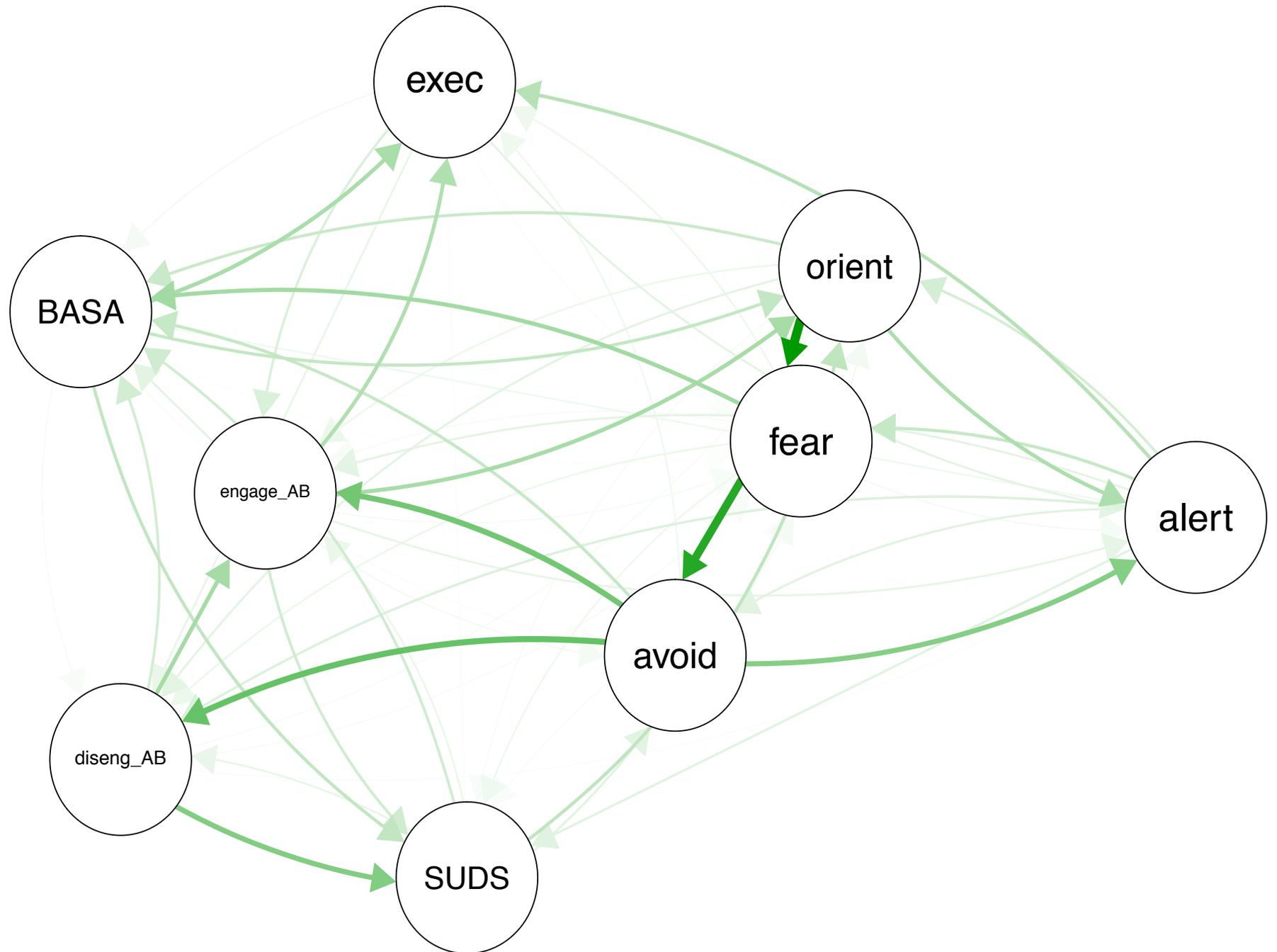
- R package *graph* (Epskamp et al., 2012)
- Relative importance network (McNally et al., 2015; Robinaugh et al., 2014)
- Relative importance metric ranges from 0 and 1, and quantifies the amount of explained variance attributable to each predictor after one controls for multicollinearity.
- We computed the *Img* relative importance metric using the R package *relaimpo* (Grömping, 2006).
- Resulting network is both weighted and directed with arrows signifying the direction and the magnitude of prediction (not causality).

Data analysis

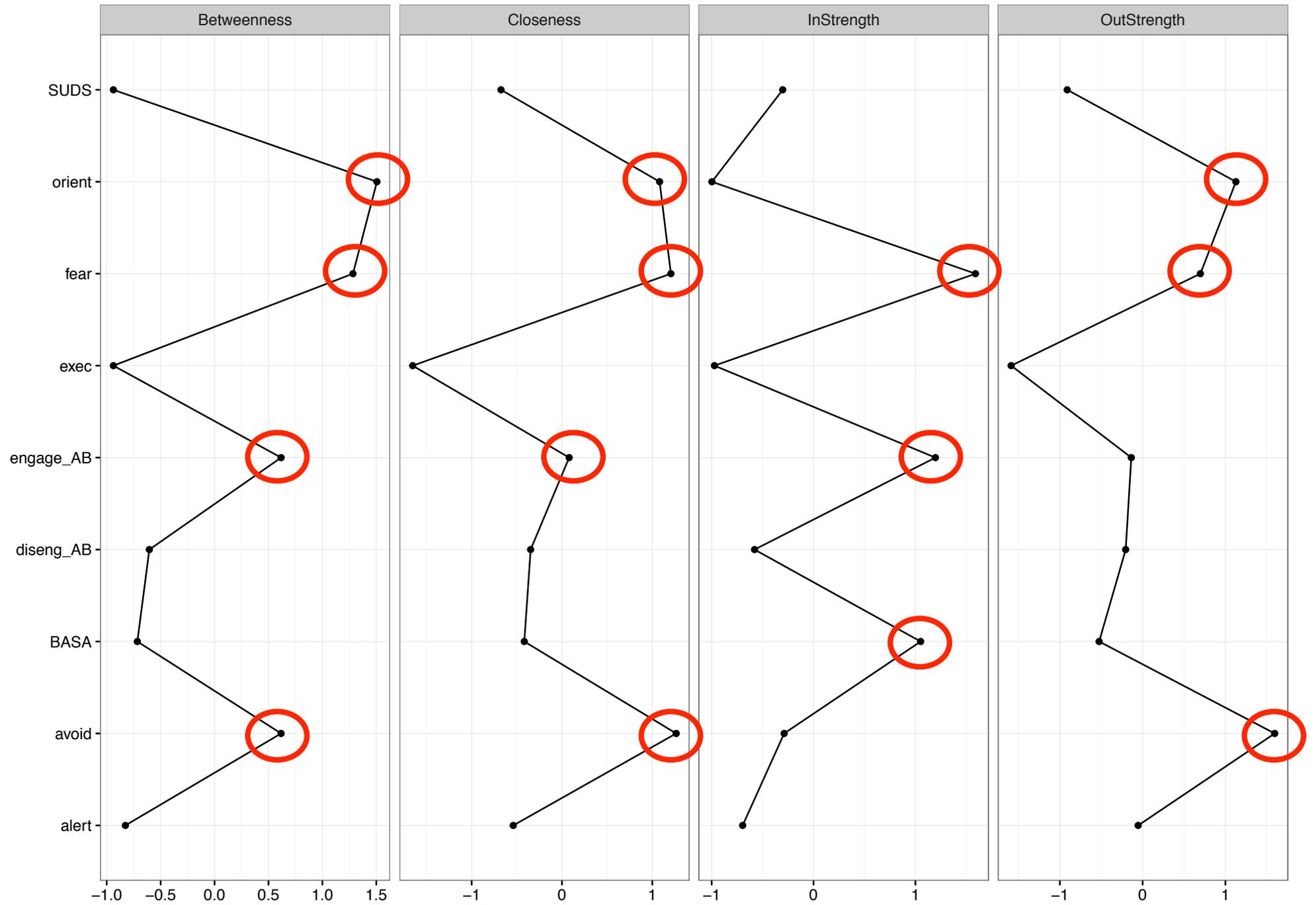
Centrality analysis (Boccaletti et al., 2006; Freeman, 1978/1979)

- **Betweenness** centrality of a node equals the number of times that it lies on the shortest path length between any two other nodes.
- **Closeness** centrality indicates the average distance of a node from all other nodes in the network, computed as the inverse of the weighted sum of shortest path lengths of a given node from all the other nodes in the network.
- **In-strength** equals the sum of the directed edge weights incident on a node that originates from other nodes in the network. It quantifies the extent to which a certain node is influenced by the other nodes of the network.
- **Out-strength** equals the sum of the directed edge weights emanating from a specific node and connecting to other nodes. It quantifies the extent to which a certain node influences other nodes in the network.
- R package *qgraph* (Epskamp et al., 2012).

Relative Importance Network



Centrality analysis



Discussion

To sum up

- **The two most central variables were avoidance of social situations and the orienting component of attention**
- **Engagement with threat yielded high centrality as a predicted variable**

Theoretical implications

- **Difference of orienting response may interact with a child's temperamental bias toward behavioral inhibition** (Kagan et al., 1988)
- **Avoidance conceptualized as a core component of anxiety disorders** (e.g., Mowrer, 1960)

Limitations

- **The cross-sectional nature of the data does not allow drawing strong inference vis-à-vis the cause-effect relationships**
- **Restricted sample size.**

Want
more...

Journal of Anxiety Disorders



An integrative network approach to social anxiety disorder: The complex dynamic interplay among attentional bias for threat, attentional control, and symptoms

Alexandre Heeren^{a,b,*}, Richard J. McNally^a

^a Department of Psychology, Harvard University, Cambridge, MA, USA

^b Psychological Science Research Institute, Université Catholique de Louvain, Louvain-la-Neuve, Belgium

ARTICLE INFO

Article history:
Received 6 April 2016
Received in revised form 17 June 2016
Accepted 23 June 2016
Available online 24 June 2016

Keywords:
Network analysis
Graph theory
Attentional bias for threat
Attention networks
Social anxiety disorder
Community detection
Computational social sciences

ABSTRACT

Cognitive models posit that social anxiety disorder (SAD) is associated with and maintained by biased attention allocation vis-à-vis social threat. However, over the last decade, there has been intense debate regarding whether AB in SAD results from preferential engagement with or difficulty in disengaging from social threat. Further, recent evidence suggests that AB may merely result from top-down attentional impairments vis-à-vis non-emotional material. Consequently, uncertainty still abounds regarding both the relative importance and the mutual interactions of these different processes and SAD symptoms. Inspired by novel network approaches to psychopathology that conceptualize symptoms as complex dynamic systems of mutually interacting variables, we computed weighted directed networks to investigate potential causal relations among laboratory measures of attentional components and symptoms of social anxiety disorder. Global and local connectivity of network structures revealed that the three most central variables were the orienting component of attention as well as both avoidance and fear of social situations. Neither preferential attention engagement with threat nor difficulty disengaging from threat exhibited high relative importance as predictors of symptoms in the network. Together, these

**Thank you for
your attention!**

Funding

This research was supported by

A Grant (F.R.S.-FNRS) from the Belgian National Fund for Scientific Research (awarded to Alexandre Heeren),

A Grant from the Helaers Foundation (awarded to Alexandre Heeren)

The Belgian Foundation for Vocation (« Vocatio ») (awarded to Alexandre Heeren)

A « WBI World Excellence Grant » (sub/2015/228106243177) (awarded to Alexandre Heeren)

Conflict of Interest

None

Contact

alexandreheeren@fas.harvard.edu

or

heeren.alexandre@gmail.com