The Art of Presenting Science

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Greatest communicators

Who?

Bullshit Rules

Bullshit rule: 1

Work will speak for itself

On August 30, 2012 Mochizuki released four preprints, whose total size was about 500 pages, that develop inter-universal Teichmüller theory and apply it to attempt to prove several very famous problems in Diophantine geometry.[8] These include the strong Szpiro conjecture, the hyperbolic Vojta conjecture and the abc conjecture over every number field. The preprints have not been published. In September 2018, Mochizuki posted a report on his work by Peter Scholze and Jakob Stix asserting that the third preprint contains an irreparable flaw; he also posted several documents containing his rebuttal of their criticism.[9] The majority of number theorists have found Mochizuki's preprints very difficult to follow and have not accepted the conjectures as settled, although there are a few prominent exceptions, including Go Yamashita, Ivan Fesenko, and Yuichiro Hoshi, who vouch for the work and have written expositions of the theory.[10][11]

Reality Rules

Reality rule: 1

Your work: your product

Talk: advertisement of your work

Good product with bad adverstisement ☹

Bad product with good adverstisement ☹

Bullshit Rules

Bullshit rule: 2
Every slide must be packed from top left to bottom right with text

More in paper

Specific problem: To determine the safety of inlining the lambda term *lam* at the call site $[\![(f \ \ldots)]\!]$, we need to know that for every environment ρ in which this call is evaluated, that $\rho[\![f]\!] = (lam, \rho')$ and $\rho(v) = \rho'(v)$ for each free variable v in the term *lam*.[2]

$$\eta(b) = \hat{b} \text{ iff } \eta(g(b)) = \hat{g}(\hat{b}).$$

$$\frac{\hat{\beta}(e_i) \in \widehat{Bind}_1 \qquad \hat{b}_i \in \widehat{Bind}_1}{\hat{\beta}(e_i) \equiv' \hat{b}_i,}$$

$$\begin{aligned}
\alpha^\eta(call, \beta, ve, t) &= (\alpha^\eta(V), \alpha^\eta(\beta), \alpha^\eta(ve), \eta(t)) \\
\alpha^\eta_{BEnv}(\beta) &= \lambda v.\eta(\beta(v)) \\
\alpha^\eta_{VEnv}(ve) &= \lambda \hat{b}. \bigsqcup_{\eta(b)=\hat{b}} \alpha^\eta(ve(b)) \\
\alpha^\eta_D(d) &= \{\alpha^\eta_{Val}(d)\} \\
\alpha^\eta_{Val}(lam, \beta) &= (lam, \alpha^\eta(\beta)).
\end{aligned}$$

$$\begin{aligned}
\hat{\varsigma} \in \hat{\Sigma} &= \mathsf{Call} \times \widehat{BEnv} \times \widehat{VEnv} \times \widehat{Time} \\
\hat{\beta} \in \widehat{BEnv} &= \mathsf{Var} \rightharpoonup \widehat{Bind} \\
\widehat{ve} \in \widehat{VEnv} &= \widehat{Bind} \rightharpoonup \hat{D} \\
\hat{d} \in \hat{D} &= \mathcal{P}(\widehat{Val}) \\
\widehat{val} \in \widehat{Val} &= \widehat{Clo} \\
\widehat{clo} \in \widehat{Clo} &= \mathsf{Lam} \times \widehat{BEnv} \\
\hat{b} \in \widehat{Bind} &\text{ is a } \textbf{finite} \text{ set of bindings} \\
\hat{t} \in \widehat{Time} &\text{ is a } \textbf{finite} \text{ set of times}
\end{aligned}$$

Theorem 4. *It is safe to rematerialize the expression e' in place of the expression e in the call site call iff for every reachable compound abstract state of the form $((call, \hat{\beta}^*, \widehat{ve}, \hat{t}), \equiv)$, it is the case that $\hat{\mathcal{E}}(e', \hat{\beta}^*, \widehat{ve}) = (lam', \hat{\beta}')$ and $\hat{\mathcal{E}}(e, \hat{\beta}^*, \widehat{ve}) = (lam, \hat{\beta})$ and the relation $\sigma \subseteq \mathsf{Var} \times \mathsf{Var}$ is a substitution that unifies the free variables of lam' with lam and for each $(v', v) \in \sigma$, $\hat{\beta}'(v') \equiv \hat{\beta}(v)$.*

$$\begin{aligned}
g_B^{-1}(b) &= b \\
g_B^{-1}(g(b)) &= \begin{cases} b & \eta(b) = \eta(b') \text{ for some } g(b') \in B \\ g(b) & \text{otherwise} \end{cases} \\
g_B^{-1}(lam, \beta) &= (lam, g_B^{-1}(\beta)) \\
g_B^{-1}(\beta) &= \lambda v. g_B^{-1}(\beta(v)) \\
g_B^{-1}(ve) &= \lambda b. g_B^{-1}(ve(b)).
\end{aligned}$$

Theorem 3. *Given a compound abstract state $((call, \hat{\beta}, \widehat{ve}, \hat{t}), \equiv)$ and two abstract bindings, $\hat{b}$ and $\hat{b}'$, if $\alpha^\eta(call, \beta, ve, t) \sqsubseteq ((call, \hat{\beta}, \widehat{ve}, \hat{t}), \equiv)$ and $\eta(b) = \hat{b}$ and $\eta(b') = \hat{b}'$ and $\hat{b} \equiv \hat{b}'$, then $ve(b) = ve(b')$.*

$$((\![(f\ e_1 \ldots e_n)^\ell]\!], \hat{\beta}, \widehat{ve}, \hat{t}), \equiv) \leadsto ((call, \hat{\beta}'', \widehat{ve}', \hat{t}'), \equiv'), \text{ where:}$$

$$\begin{aligned}
\hat{d}_i &= \hat{\mathcal{E}}(e_i, \hat{\beta}, \widehat{ve}) \\
\hat{d}_0 &\ni ([\![(\lambda^{\ell'}\ (v_1 \ldots v_n)\ call)]\!], \hat{\beta}') \\
\hat{t}' &= \widehat{tick}(call, \hat{t}) \\
\hat{b}_i &= \widehat{alloc}(v_i, \hat{t}') \\
\hat{B} &= \left\{\hat{b}_i : \hat{b}_i \in \widehat{Bind}_1\right\} \\
\hat{\beta}'' &= (\hat{g}_{\hat{B}}^{-1}\hat{\beta}')[v_i \mapsto \hat{b}_i] \\
\widehat{ve}' &= (\hat{g}_{\hat{B}}^{-1}\widehat{ve}) \sqcup [\hat{b}_i \mapsto (\hat{g}_{\hat{B}}^{-1}\hat{d}_i)].
\end{aligned}$$

Theorem 2. *If $\alpha^\eta(\beta_1) = \hat{\beta}_1$ and $\alpha^\eta(\beta_2) = \hat{\beta}_2$, and $\hat{\beta}_1(v) = \hat{\beta}_2(v)$ and $\hat{\beta}_1(v) \in \widehat{Bind}_1$, then $\beta_1(v) = \beta_2(v)$.*

Theorem 1. *If $\alpha^\eta(\varsigma) \sqsubseteq \hat{\zeta}$ and $\varsigma \Rightarrow \varsigma'$, then there exists a state $\hat{\zeta}'$ such that $\hat{\zeta} \leadsto \hat{\zeta}'$ and $\alpha^\eta(\varsigma') \sqsubseteq \hat{\zeta}'$.*

$$alloc : \mathsf{Var} \times Time \to Bind \qquad \widehat{alloc} : \mathsf{Var} \times \widehat{Time} \to \widehat{Bind}$$

$$tick : \mathsf{Call} \times Time \to Time \qquad \widehat{tick} : \mathsf{Call} \times \widehat{Time} \to \widehat{Time}$$

$$([\![(f\ e_1 \ldots e_n)^\ell]\!], \hat{\beta}, \widehat{ve}, \hat{t}) \leadsto (call, \hat{\beta}'', \widehat{ve}', \hat{t}'), \text{ where:}$$

$$\begin{aligned}
\hat{d}_i &= \hat{\mathcal{E}}(e_i, \hat{\beta}, \widehat{ve}) \\
\hat{d}_0 &\ni ([\![(\lambda^{\ell'}\ (v_1 \ldots v_n)\ call)]\!], \hat{\beta}') \\
\hat{t}' &= \widehat{tick}(call, \hat{t}) \\
\hat{b}_i &= \widehat{alloc}(v_i, \hat{t}') \\
\hat{B} &= \left\{\hat{b}_i : \hat{b}_i \in \widehat{Bind}_1\right\} \\
\hat{\beta}'' &= (\hat{g}_{\hat{B}}^{-1}\hat{\beta}')[v_i \mapsto \hat{b}_i] \\
\widehat{ve}' &= (\hat{g}_{\hat{B}}^{-1}\widehat{ve}) \sqcup [\hat{b}_i \mapsto (\hat{g}_{\hat{B}}^{-1}\hat{d}_i)],
\end{aligned}$$

$$([\![(f\ e_1 \ldots e_n)^\ell]\!], \beta, ve, t) \Rightarrow (call, \beta'', ve', t'), \text{ where:}$$

$$\begin{aligned}
d_i &= \mathcal{E}(e_i, \beta, ve) \\
d_0 &= ([\![(\lambda^{\ell'}\ (v_1 \ldots v_n)\ call)]\!], \beta') \\
t' &= tick(call, t) \\
b_i &= alloc(v_i, t') \\
B &= \{b_i : b_i \in Bind_1\} \\
\beta'' &= (g_B^{-1}\beta')[v_i \mapsto b_i] \\
ve' &= (g_B^{-1}ve)[b_i \mapsto (g_B^{-1}d_i)],
\end{aligned}$$

Reality Rules

Reality rule: 2
Minimal text; Each slide should showcase only one thing
YOU need to talk about the content

Bullshit Rules

Bullshit rule: 3
Will convince my audience,
I have done LOTS of work

Reality Rules

Reality rule: 3

Quantity of work doesn't matter

Quality does

Bullshit Rules

Bullshit rule: 4

Pictures and Figures are pointless

Reality Rules

Reality rule: 4

Picture is worth a thousand words

Even in mathematical communication

Bullshit Rules

Bullshit rule: 5
Present every single step in proof so that people will know I have done it correctly

Reality Rules

Reality rule: 5
Writing an article is different from presenting your work

Reality Rules

Reality rule: 5

Writing an article is different from presenting your work

Encapsulate the ideas of the theorems and proofs

Reality Rules

Reality rule: 5

Writing an article is different from presenting your work

Encapsulate the ideas of the theorems and proofs

True understanding

Bullshit Rules

Bullshit rule: 6
Don't talk about failures or incorrect attempts

Reality Rules

Reality rule: 6
The path you took is more important than result

Bullshit Rules

Bullshit rule: 7
Be serious;
No jokes, no deviations;
Only content

Reality Rules

Reality rule: 7
Your audience are not ROBOTS

Bullshit Rules

Bullshit rule: 8
Same content works for all audience

Reality Rules

Reality rule: 8
Audience are our customers

Bullshit Rules

Bullshit rule: 9

No need to motivate the talk

Reality Rules

Reality rule: 9

Spend almost a quarter of the talk on motivation

Bullshit Rules

Bullshit rule: 10

More slides $\implies$ More work

Reality Rules

Reality rule: 10

If I Had More Time, I Would Have Written a Shorter Letter.

Bullshit Rules

Bullshit rule: 11

Talk fast $\implies$ More words $\implies$ More work

Reality Rules

Reality rule: 11
Talk short sentences at the right pace.

Bullshit Rules

Bullshit rule: 12
Presentations should be monologue.

Reality Rules

Reality rule: 12

Engage your audience.

Other points to remember

Have a catchy title

Other points to remember

Do not have an outline slide
It is boring; Suspense is lost

Other points to remember

Start with a question or an interesting fact

Other points to remember

Start with a question or an interesting fact

Use that as a motivation

Other points to remember

Tell a story

Build up the suspense

Other points to remember

Do not memorize your talk!

Other points to remember

Do not memorize your talk!
Try to adapt on the fly!

Other points to remember

Do not memorize your talk!
Try to adapt on the fly!
Extempore!

Other points to remember

You are the hero(ine)!

Other points to remember

You are the hero(ine)!
Don't become a villain!

Other points to remember

Show current slide/total slides

Other points to remember

Show current slide/total slides

Have a good climax

Other points to remember

Show current slide/total slides

Have a good climax

Finish on time with a bang!