

Computer Viruses in Urban Indian Telecenters: Characterizing an Unsolved Problem

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Computer Viruses in the Developing World

- **Cited as a major problem**
 - In Ghana [Best 2010]
 - In India [Haseloff 2005]
 - In Kenya [Wyche 2010]
 - In Nigeria [Adomi 2007]
 - In Uganda [Mwesige 2004]
 - In Uzbekistan [Kolko 2009]
- **Many possible explanations**
 - Economics: can't afford registered antivirus
 - Connectivity: can't download latest signatures
 - Education: lack of awareness and training
- **To date, mostly anecdotal evidence**

This Paper: A Systematic Characterization of the Virus Problem

- **Via a survey of 25 telecenters in Bangalore, India**
- **Basic finding:
Viruses remain an important unsolved problem**

80% of locations have moderate to high prevalence of viruses.

Yet 88% of locations are running antivirus software!

- **In this talk:**
 - Impact of viruses
 - Coping strategies
 - Possible solutions

Context: Urban Indian Telecenters

- **In India:**

- 180,000 cyber cafes
- 40,000 other telecenters
- 37% of 22 million urban Internet users rely on public access terminals

- **Common applications:**

- Resume preparation / job search
- Arranging travel (train, bus, air)
- Entertainment (games, Facebook, etc.)

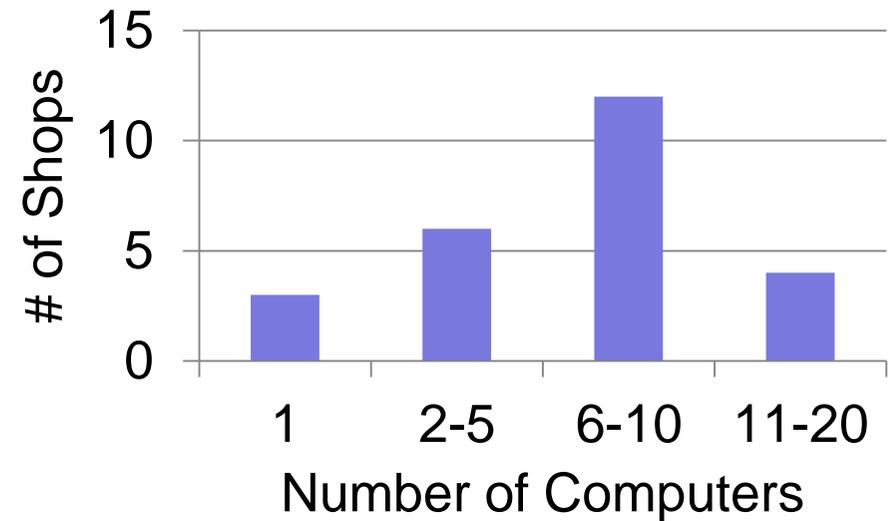
- **Customers typically pay Rs. 10 (\$0.22) per hour**



Software Ecosystem of Telecenters

- **Focus: small shops with shared-access machines**

- Internet cafes (18)
- Mobile/photo studios (5)
- Photocopy centers (2)



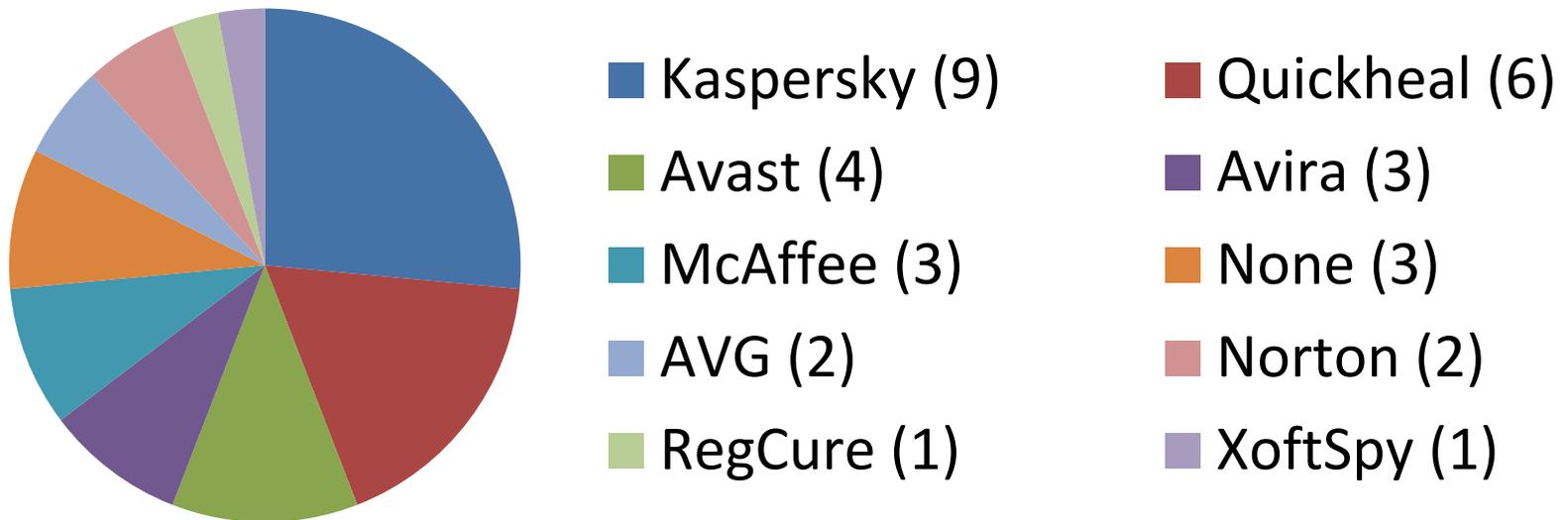
- **Vast majority use Windows XP, and non-genuine**

- “Who in today’s world uses a genuine copy of Windows sir?”

- **Tech support via external helpers (\$5-\$10 per visit)**

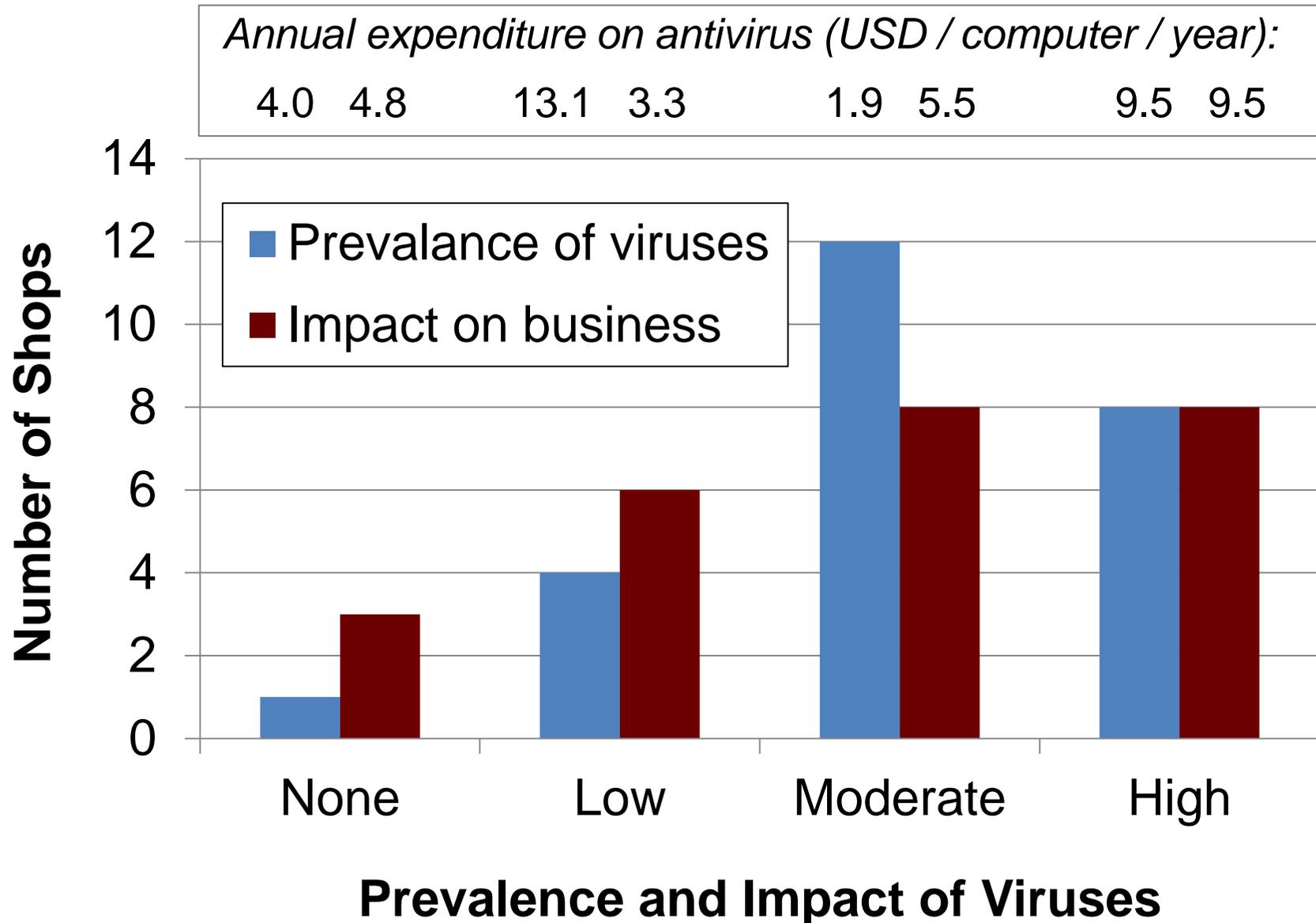
Large Investment in Antivirus Software

- **88% of centers are running antivirus software**



- **Of antivirus users, 72% pay for licensed versions**
 - Paying users spend about \$10 per machine per year
 - Non-paying users have cracked or trial versions

Prevalence and Impact of Viruses



“

An entire marriage ceremony tape got ruined at one time. All the audio and video files suddenly changed type into an unknown format and wouldn't open in any existing player. The customer ended up losing all the precious data from the ceremony, and was really furious about it.”

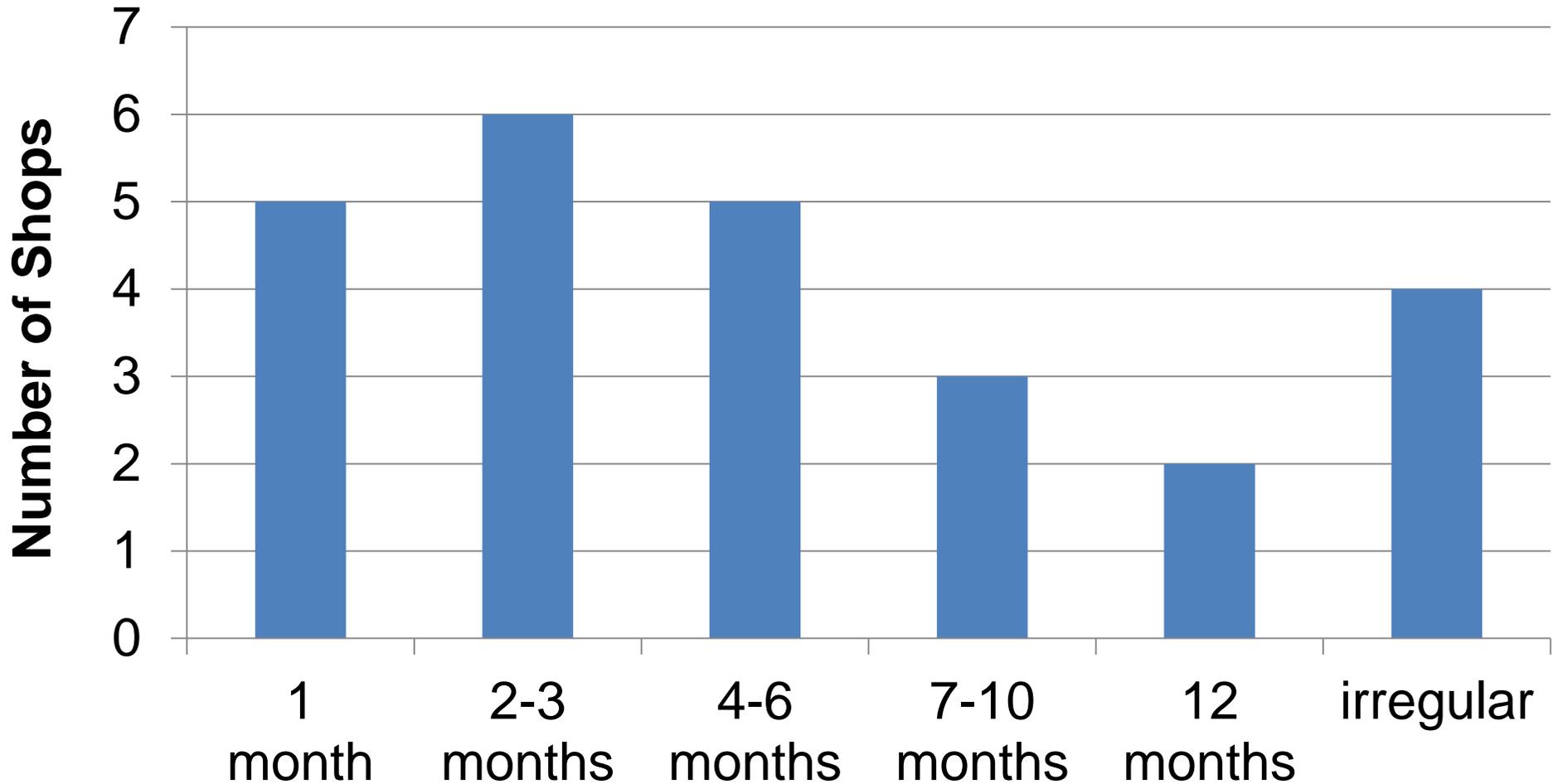
— *Manager of a photo studio*

“

The problem with my antivirus is that when I scan my computer, if it finds an infected file, instead of removing the virus, it ends up removing the whole file. Twice, important customer data has got lost due to this scanning process. Hence, I ignore all such alert messages.”

— *Manager of a photocopy center*

Re-Installing the Operating System



**Average Lifetime of OS Installation
(Time Between Successive Wipe & Re-installs)**

Rollback and Recovery Software



- **We found four installations of Deep Freeze**

- But, inactive or not helping to control virus problem

- “ *Oh, Deep Freeze does not get rid of your virus problems. I kept having these viruses, due to unsafe browsing, due to which I finally got myself an antivirus.* ”

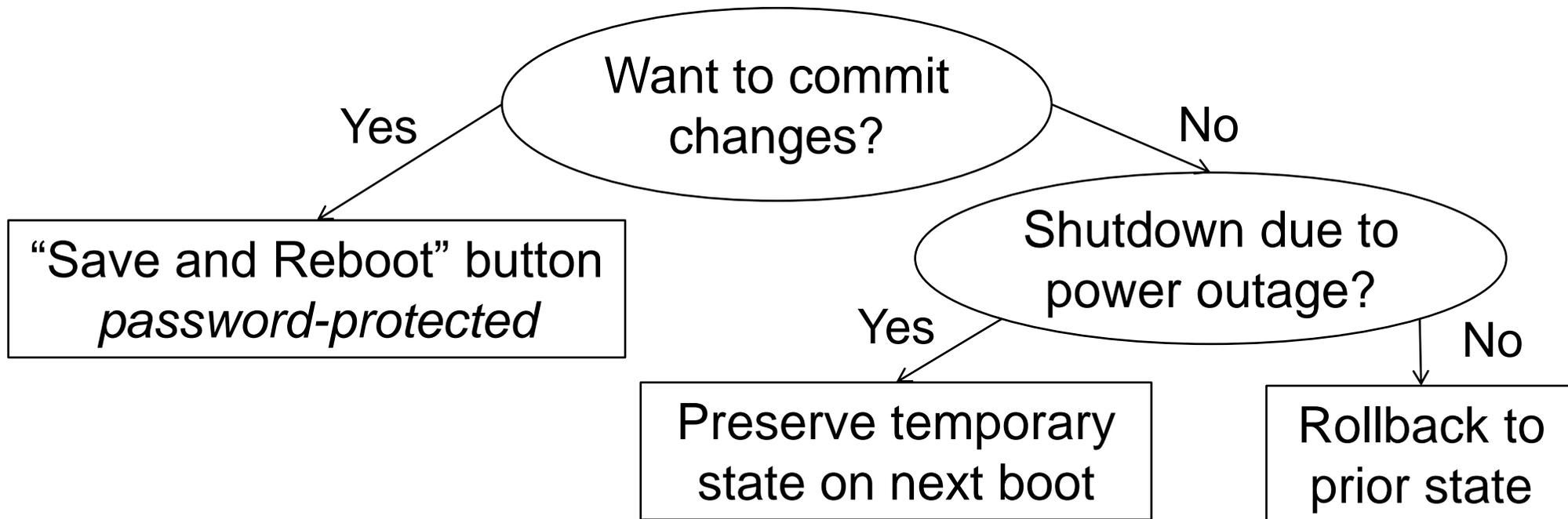
- Hypothesis: difficult for users to toggle admin mode

Rollback and Recovery Software



- **Shortcomings of rollback software in dev regions:**
 - Does not match mental model of virus control
 - Loses customer data on power outage
 - Security vulnerability:
 - SafeSys worm compromised 45,000 machines in Asia
- **Big opportunity to improve on rollback software!**

Current Direction: An Improved Rollback Engine



- **In addition:**

- Bundled with a Windows installer: no configuration
- Uses Microsoft Virtual Hard Disks for efficiency, security
 - Avoids SafeSys vulnerability
 - Less overhead than a virtualization solution

Opportunities and Constraints

- **Must not inconvenience the customer**

“ I cannot enforce any such strategy [of scanning USB drives] or policy as that might end up troubling the customers. If a customer brings an infected disk/drive, I really don't have an option. ”

Opportunities and Constraints

- **Must not inconvenience the customer**
- **Curb unsafe browsing practices**
 - “ Earlier, there were a lot of customers who used to frequent my shop in the evenings to visit pornographic sites. Those days, at least one system used to go down every single day, and I had to format the machine in the mornings. Then I turned the systems to face me, and they stopped coming. ”

Opportunities and Constraints

- **Must not inconvenience the customer**
 - **Curb unsafe browsing practices**
 - **Leverage willingness to pay**
 - “ I’m sure all studios like us wouldn’t mind in spending an additional 500-1000 rupees [\$11 - \$22] on a much better antivirus software. Even though all major antivirus providers make tall claims, none of them are actually significantly useful in tackling the issue.”
- 84% of shop owners willing to pay more for antivirus!

Why Does Virus Problem Persist?

- **We don't know for sure. Some possibilities:**
 - Viruses are common due to unprotected machines, making it difficult to protect any one machine
 - Older machines, lower connectivity, non-expert users
 - Need for malware protection in addition to antivirus?
 - Viruses in India not caught by Western antivirus?
- **Many of these questions could be answered by doing an “epidemiology” of computer viruses**

Gotta Catch 'Em All!
**Innoculous: Enabling Epidemiology of Computer Viruses
in the Developing World**

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Conclusions

- **Computer viruses remain an important unsolved problem for shared-usage machines in India**
 - Despite widespread adoption of antivirus software
 - Despite willingness to pay for a better solution



Internet café owner in Bangalore

- **Interesting research opportunities in:**
 - Designing a usable and secure rollback mechanism
 - Understanding the ecosystem of viruses themselves