TED演讲者：Nilay Kulkarni | 尼莱库卡尼

演讲标题： A life-saving invention that prevents human stampedes | 预防在人群中被踩死的救命发明

内容概要： Every three years, more than 30 million Hindu worshippers gather for the Kumbh Mela in India, the world.s largest religious gathering, in order to wash away their sins. With massive crowds descending on small cities and towns, stampedes inevitably happen, and in 2003, 39 people were killed during the festival. In 2014, then 15-year-old Nilay Kulkarni decided to put his skills as a self-taught programmer to use by building a tech solution to help prevent stampedes. Learn more about his invention -- and how it helped the 2015 Nashik Kumbh Mela have zero stampedes and casualties.

每三年，世界上最大宗教集会之一的印度大壶节，都会有三千万印度教参拜者聚集，希望将其罪恶洗去。大量的群众突然涌入小城市和小镇，无可避免会有人被踩死，在 2003 年，有 39 人在节庆中丧命。在 2014 年，15 岁的尼莱库卡尼决定要把他身为自学程式设计师的技能发挥出来，建立一个技术解决方案，来协助预防人被踩死。来进一步了解他的发明，以及它如何协助 2015 年纳西克大壶节达成完全无死伤的目标。

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I was only nine when my grandfather first described to me the **horrors** he **witnessed** six years earlier when human **stampedes** killed 39 people in our hometown of Nashik, India.	我只有九岁的时候，祖母第一次向我描述了 她在六年前目击的恐怖情景，蜂拥的人群造成了 39 人被踩死，地点在我们的家乡,印度的纳西克。[00:12]
It was during the 2003 Nashik Kumbh **Mela**, one of the world's largest **religious gatherings**.	那是 2003 年纳西克大壶节期间，世界上最大的宗教集会之一。[00:24]
Every 12 years, over 30 million **Hindu worshippers descend upon** our city -- which is built only for 1.5 million people -- and stay for 45 days.	每 12 年,就有超过 三千万印度教参拜者 突然造访我们的城市—— 城市设计的容量为一百五十万人—— 他们会停留 45 天。[00:31]
The main purpose is to wash away all their **sins** by **bathing** in the river Godavari.	主要的目的,是要洗净他们的罪恶，方式是在哥达瓦里河中洗澡。[00:41]
And stampedes may easily happen because a **high-density** crowd moves at a slow pace.	踩死人的事件很容易发生，因为高密度的人群以低速度在移动。[00:47]
Apart from Nashik, this event happens in three other places in India, with **varying** frequency, and between 2001 and 2014, over 2,400 lives have been lost in stampedes at these events.	除了纳西克,印度还有 其他三个地方也有这项节庆，举办频率不同，在 2001 年到 2014 年间，在这些活动中就有 超过 2400 人被踩死。[00:53]

horrors: n.惊骇;惨状;极端厌恶;令人恐怖的事物 **witnessed:** n.证人;目击者;证据/vt.目击;证明;为...作证/vi.作证人 **stampedes:** n.惊跑;人群的蜂拥;军队溃败/vi.蜂拥;惊逃/vt.使...惊逃;抢占 **religious:** adj.宗教的； 虔诚的； 严谨的； 修道的/n.修道士； 尼姑 **gatherings:** n.聚会(gathering的复数) **Hindu:** adj.印度的;印度教的/n.印度人;印度教教徒 **worshippers:** n.崇拜者;礼拜者;爱慕者 **descend upon:** vt.突然到达;袭击(突然降临) **sins:** n.罪恶 **bathing:** n.沐浴;游泳;洗海水澡/v.洗浴(bath的现在进行式) **high-density:** adj.高密度的 **Apart from:** 除...之外;且不说;并且 **varying:** adj.不同的;变化的/v.变化,改变(vary的现在分词)

What **saddened** me the most is seeing people around me **resigning** to the city's fate in **witnessing** the seemingly inevitable deaths of dozens at every Kumbh Mela.	最让我感伤的是，看到我身边的人 听任这个城市的命运，在每次大壶节都要目击 似乎无法避免的 数十起死亡。[01:09]
I sought to change this, and I thought, why can't I try to find a solution to this?	我想要改变这状况，我心想,我为什么不找个解决方案? [01:21]
Because I knew it is wrong.	因为我知道这是错的。[01:25]
Having learned **coding** at an early age and being a maker, I considered the wild idea --	我早期曾经学过程式，加上身为制造者，我有个很狂妄的点子——[01:27]
(Laughter)	（笑声）[01:32]
[Makers always find a way] I considered the wild idea of building a system that would help regulate the flow of people and use it in the next Kumbh Mela in 2015, to have fewer stampedes and, hopefully, fewer deaths.	〔制造者总会找到出路〕 我的狂野点子就是要建立一个系统，可以协助控管人的流量，并用在下一次的 2015 年大壶节中，减少蜂涌的情况，希望也能减少死亡人数。[01:33]
It seemed like a mission impossible, a dream too big, especially for a 15-year-old, yet that dream came true in 2015, when not only did we **succeed in** reducing the stampedes and their **intensity**, but we marked 2015 as the first Nashik Kumbh Mela to have zero stampedes.	这似乎是个不可能的任务，这个梦想太大了，特别是对一个 15 岁男孩而言，然而,这个梦想在 2015 年实现了，我们不仅成功减少了 蜂涌的情况以及人潮的密度，我们还让 2015 年成为 第一个没有人被踩死的 纳西克大壶节。[01:47]

saddened: v.使...悲伤;使...黯然(sadden的过去分词)/adj.悲伤的;惨然的 **resigning:** 辞职/使屈从 **witnessing:** v.目击(witness的ing形式) **coding:** n.译码/v.把...编码(code的ing形式) **succeed in:** 成功;在...方面成功;顺利完成 **intensity:** n.强度； 强烈； [电子]亮度； 紧张

(Applause) It was the first time in recorded history that this event passed without any **casualties**.	（掌声） 那是历史记录中第一次，这个活动到结束都没有伤亡。[02:11]
How did we do it?	我们怎么做到的? [02:22]

It all started when I joined an **innovation** workshop by MIT Media Lab in 2014 called the Kumbhathon that aimed at solving challenges faced at the grand scale of Kumbh Mela.	一切始于我加入一个创新研讨会, 是麻省理工学院 媒体实验室 在 2014 年办的, 叫做大壶马拉松 (Kumbhathon)。 目标是要解决在大壶节这么 大 规模的节庆所面临的难题。 [02:24]
Now, we figured out to solve the stampede problem, we wanted to know only three things: the number of people, the location, and the rate of the flow of people per minute.	我们想出了要如何 解决踩死人的问题, 我们只想知 道三样资讯: 人数、地点, 以及每分钟的人流量。 [02:37]
So we started to look for technologies that would help us get these three things.	我们就开始寻找有什么技术 能协助我们取得这三 项资讯。 [02:51]
Can we distribute **radio-frequency tokens** to identify people?	我们能不能分发无线电频率的 凭证来识别每个 人? [02:55]
We figured out that it would be too expensive and **impractical** to distribute 30 million **tags**.	我们觉得这样成本太高且不实际, 很难去分发三千 万个吊牌。 [03:00]
Can you use CCTV cameras with image-processing techniques?	我们能不能用闭路电视摄影机 搭配影像处理技 术? [03:06]
Again, too expensive for that scale, along with the **disadvantages** of being non-portable and being completely useless in the case of rain, which is a common thing to happen in Kumbh Mela.	一样,用在这么大规模也太贵了, 还有个缺点就是无 法带着走, 在下雨时就完全没用了, 而在大壶节常 常会下雨。 [03:09]

Can we use cell phone tower data?	我们能用手机信号塔的资料吗? [03:20]
It sounds like the perfect solution, but the funny part is, most of the people do not carry cell phones in events like Kumbh Mela.	听起来是完美的解决方案, 但好笑的部分是, 大部 分的人不会带手机 到大壶节这类活动中。 [03:23]
Also, the data wouldn't have been **granular** enough for us.	此外,资料对我们来说也不够精细。 [03:32]
So we wanted something that was **real-time**, **low-cost**, **sturdy** and **waterproof**, and it was easy to get the data for processing.	所以我们想要的必须是即时、 低成本、耐用、防 水, 且要很容易取得资料来做处理。 [03:36]
So we built Ashioto, meaning "footstep" in Japanese, as it **consists** of a portable mat which has pressure **sensors** which can count the number of people walking on it, and sends the data over the internet to the advanced data analysis software we created.	所以我们建造了 Ashioto, 在日文的意思是「脚 步」, 它是由可携式的垫子所构成, 垫子有压力感 测器, 能够计算走在上面的人数, 透过网路把这资 料传输 到我们建造的进阶资料分析软体。 [03:45]
The possible errors, like **overcounting** or double-stepping, were overcome using design **interventions**.	我们设计了干预方式, 来克服过高估计 或反覆踩踏 这类的可能错误。 [04:02]
The **optimum** breadth of the mat was determined to be 18 inches, after we tested many different versions and **observed** the average **stride** length of a person.	我们决定最理想的 垫子宽度是 18 英吋, 这是在我 们测试了许多不同版本 并观察人的平均步距之后 决定的。 [04:08]

Otherwise, people might step over the sensor.	不然,人们可能会踩超过感测器。 [04:17]
We started with a proof of concept built in three days, made out of **cardboard** and **aluminum foil**.	我们一开始先要证明 这个概念,在三天内 用厚纸板 和铝箔纸 打造出测试用的样品。 [04:20]
(Laughter) It worked, **for real**.	（笑声） 它有用,是真的。 [04:26]
We built another one with aluminum **composite panels** and **piezoelectric** plates, which are plates that generate a small pulse of electricity under pressure.	我们又用铝复合板以及压电板 再打造了一个样品, 压电板在受到压力时 会产生出小的电脉冲。 [04:29]
We tested this at 30 different pilots in public, in crowded restaurants, in **malls**, in temples, etc., to see how people reacted.	我们在三十个地点测试了 这个设计,包括公开场 所、 拥挤的餐厅、购物中心、庙宇等等, 看看人们 的反应如何。 [04:38]
And people let us run these pilots because they were excited to see localites work on problems for the city.	大家都让我们做这些测试, 因为他们很兴奋能够看 到 当地有人要为城市解决问题。 [04:48]
I was 15 and my team members were in their early 20s.	我那时十五岁,我的 团队成员都二十岁出头。 [04:57]
When the sensors were colored, people would get scared and would ask us questions like, "Will I get **electrocuted** if I step	当感测器加上了颜色, 人们会紧张,问我们像这样的 问题: 「如果我踩上去会被电击吗? 」[05:01]

on this?"

(Laughter) Or, if it was very obvious that it was an electronic sensor on the ground, they would just **jump over** it.	（笑声） 或者,如果很明显 地上有个电子感测器,他们就会跳过它。[05:11]
(Laughter) So we decided to design a cover for the sensor so that people don't have to worry what it is on the ground.	（笑声） 所以我们决定要为感测器做个罩子, 这样人们就不用担心 地上的那个东西是什么。[05:18]
So after some experimentation, we decided to use an industrial sensor, used as a safety trigger in **hazardous** areas as the sensor, and a black **neoprene** rubber sheet as the cover.	经过一些实验之后, 我们决定使用工业用感测器, 在危险区域用的安全触发器 来当感测器, 用黑色合成橡胶片 来当外罩。[05:25]
Now, another added benefit of using black rubber was that dust naturally **accumulates** over the surface, eventually **camouflaging** it with the ground.	用黑色橡胶的额外好处是 尘土会自然在表面上堆积, 最终会成为它的保护色, 看来就像地板。[05:38]
We also had to make sure that the sensor is no higher than 12 **millimeters**.	我们也得要确保感测器 不能高过 12 公厘。[05:47]
Otherwise, people might trip over it, which in itself would cause stampedes.	不然可能会绊倒人, 结果是它造成人被踩死。[05:53]
(Laughter) We don't want that.	（笑声） 我们不希望这样。[05:57]
(Laughter) So we were able to design a sensor which was only 10 millimeters thick.	（笑声） 所以我们设计了一个 感测器,厚度只有 10 公厘。[06:02]

Now the data is sent to the server in real time, and a heat map is **plotted**, taking into account all the active devices on the ground.	资料会被即时传送到伺服器, 画出热区图, 考量所有在地上的已启动装置。[06:09]
The **authorities** could be **alerted** if the crowd movement slowed down or if the crowd density moved beyond a desired **threshold**.	如果群众的移动速度慢下来, 或是群众密度超过希望的标准, 当权机关就会收到警讯。[06:16]
We installed five of these **mats** in the Nashik Kumbh Mela 2015, and counted over half a million people in 18 hours, **ensuring** that the data was available in real time at various **checkpoints**, **ensuring** a safe flow of people.	我们在 2015 年的纳西克 大壶节安装了五个垫子, 计算到的人数 确保可以从各检查站即时取得资料, 确保人流的安全。[06:24]
Now, this system, eventually, with other **innovations**, is what helped prevent stampedes altogether at that festival.	最终,就是这个系统和其他的创新 一起协助避免了在 该节庆中踩死人的意外。[06:40]
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The code used by Ashioto during Kumbh Mela will soon be made publicly available, free to use for anyone.	在大壶节中所使用的 Ashioto 程式码, 很快就会被公开, 提供大家免费使用。[06:47]
I would be glad if someone used this code to make many more gatherings safer.	我很希望看到有人能用这程式码 来让更多聚会变得更安全。[06:53]

Having succeeded at Kumbh Mela has inspired me to help others who may also **suffer from** stampedes.	在大壶节的成功鼓舞了我, 让我想要协助其他可能受到蜂涌群众所苦的人。[06:58]
The design of the system makes it **adaptable** to pretty much any event that involves an organized gathering of people.	这个系统的设计, 有组织的人类聚会相关活动都可以。[07:04]
And my new dream is to improve, adapt and deploy the system all over the world to prevent loss of life and ensure a safe flow of people, because every human soul is precious, whether at **concerts** or **sporting** events, the **Maha** Kumbh Mela in Allahabad, the **Hajj** in **Mecca**, the Shia procession to Karbala or at the **Vatican** City.	而我的新梦想是要改善、 改造,并部署这个系统, 推行到全世界,来预防 人命损失,确保人流安全, 因为每个人的生命都是可贵的, 不论是在演唱会或运动比赛、 安拉阿巴德的大壶节、 麦加的朝圣、 前往卡尔巴拉的什叶游行, 或梵蒂冈。[07:13]
So what do you all think, can we do it?	你们怎么想? 我们能办得到吗? [07:35]
(Audience) Yes!	（观众） 能! [07:37]
Thank you.	谢谢。[07:38]
(Cheers)	（欢呼） [07:39]
(Applause)	（掌声） [07:40]

(concert的复数);合奏(曲) **sporting:** adj.运动的;冒险性的;公正的;喜好运动的/v.娱乐;玩弄(sport的ing形式) **Maha:** n.紫面叶猴 **Hajj:** n.麦加朝圣;哈吉 **Mecca:** n.麦加（沙特阿拉伯一座城市）；众人渴望去的地方 **Vatican:** n.梵蒂冈;罗马教廷