



Google
Developers



Building Polished Drive Apps

How to make your apps rock

June 27, 2012 (Google I/O 2012)

Mike Procopio, Software Engineer, Google Drive SDK
Steven Bazyl, Developer Advocate, Google Drive SDK



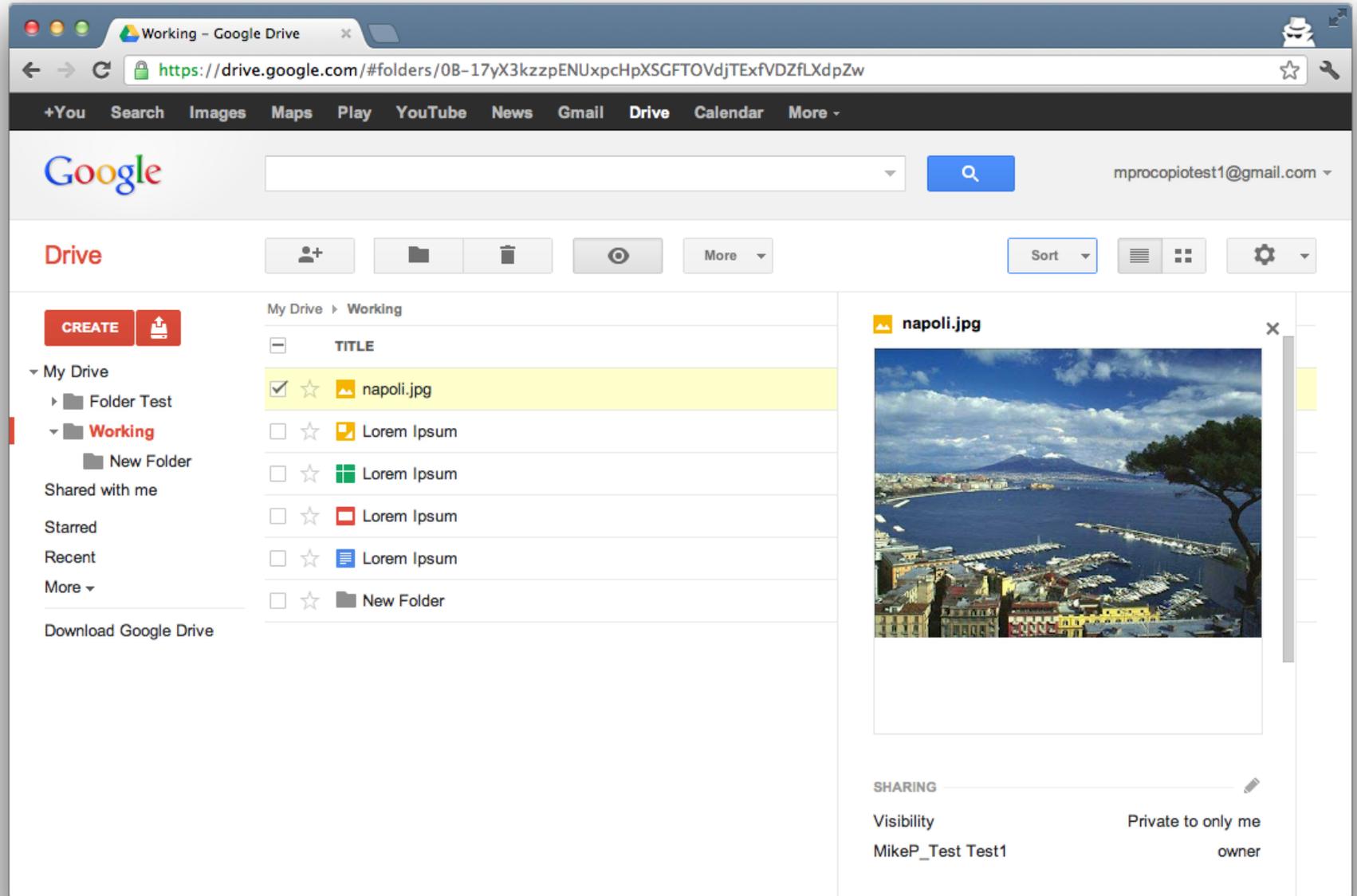
Google Drive

Store files safely in the cloud

Sharing, searching, collaboration, file revisions, OCR, organization...

Keep files in sync across devices

Access files anywhere



So where are we at today with Drive?

- **Millions** of users have opted in to drive.
- Access **anywhere**: on the web, on mobile devices, and using Chrome OS
- Easy-to-use, fully featured **SDK** with client library support in 8 languages
- 50 third-party Drive apps available in the Chrome Web Store

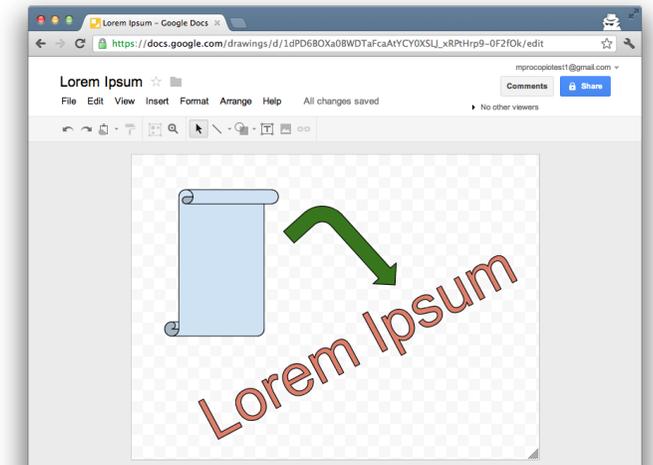
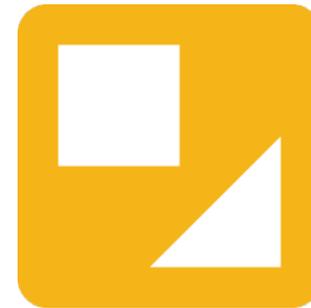
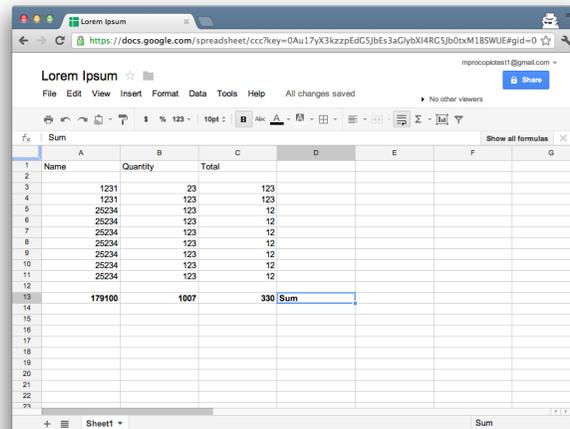
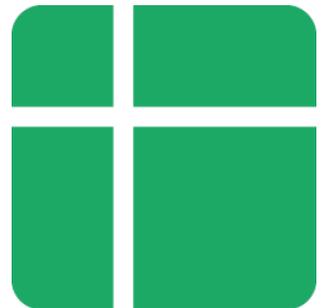
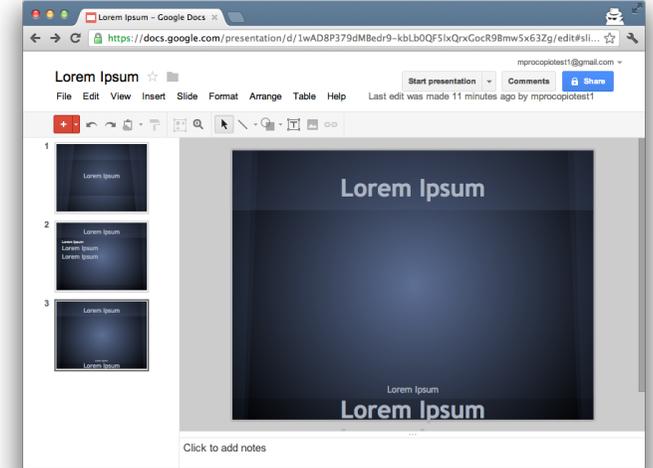
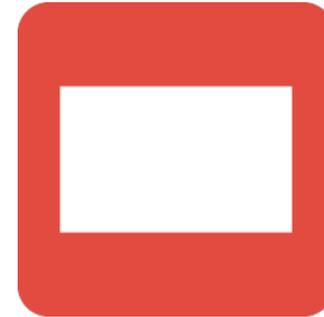
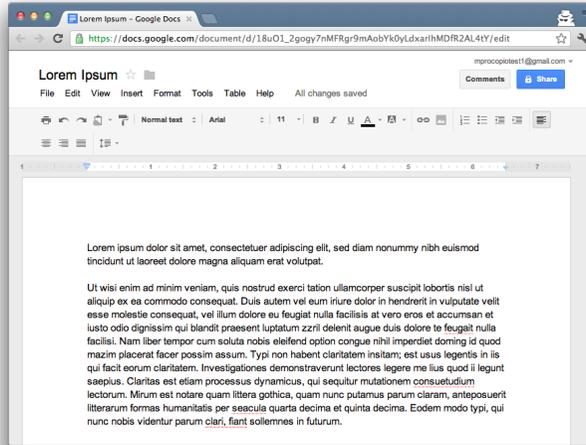


Pretty good foundation. So what's next? You :)



Built-in first-class, collaborative productivity apps

Documents, Spreadsheets, Presentations, and Drawings

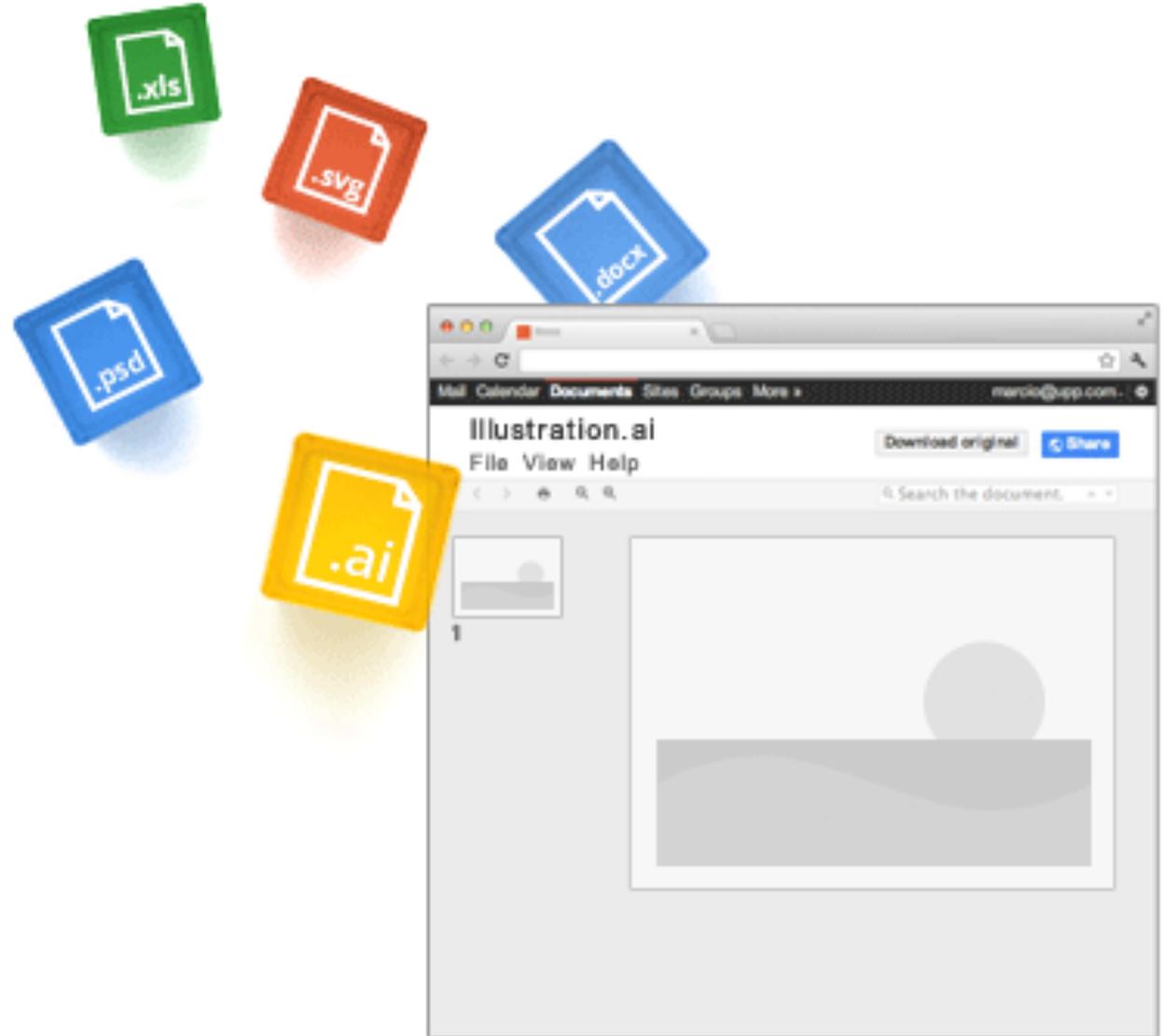


Google Drive Viewer

Built-in previewer for many file types

- PDF
- Images
- Videos
- Text
- Some proprietary formats
 - Photoshop
 - Illustrator
 - Microsoft Office
 - etc.
- But...

Basic preview only!



Google Drive Viewer

Read scintillating scientific publications (PDFs).

The screenshot shows a web browser window displaying a PDF document in Google Drive. The browser's address bar shows the URL: <https://docs.google.com/file/d/0B-17yX3kzzpEb3F2RjNkRkJO2M/edit>. The document title is "procopio_icra2010.pdf". The document content includes the following text:

2010 IEEE International Conference on Robotics and Automation
Anchorage Convention District
May 3-8, 2010, Anchorage, Alaska, USA

Coping with Imbalanced Training Data for Improved Terrain Prediction in Autonomous Outdoor Robot Navigation

Michael J. Procopio, Jane Mulligan, and Greg Grudic

Abstract— Autonomous robot navigation in unstructured outdoor environments is a challenging and largely unsolved area of active research. The navigation task requires identifying safe, traversable paths that allow the robot to progress towards a goal while avoiding obstacles. Machine learning techniques are well adapted to this task, accomplishing *near-to-far learning* by training appearance-based models using near-field stereo readings in order to predict safe terrain and obstacles in the far field. However, these methods are subject to degraded performance when training data sets exhibit *class imbalance*, or skew, where data instances of one class outnumber those in another. In such scenarios, classifiers can be overwhelmed by the *majority class*, and will tend to ignore the *minority class*. In this paper, we show that typical outdoor terrain scenarios are associated with training data imbalance, and examine the impact of using undersampling, oversampling, SMOTE, and biased penalties techniques to correct for imbalance in stereo-derived training data. We conduct a statistically significant, repeated measures empirical evaluation and demonstrate improved far-field terrain prediction performance when using such methods for handling class imbalance versus taking no corrective action at all.

I. INTRODUCTION

Autonomous robot navigation in unstructured outdoor environments is a challenging and largely unsolved area of active research. The navigation task requires identifying safe, traversable paths that allow the robot to progress towards a goal while avoiding obstacles. Stereo vision allows for obstacle avoidance in the near field (here, within 10m of

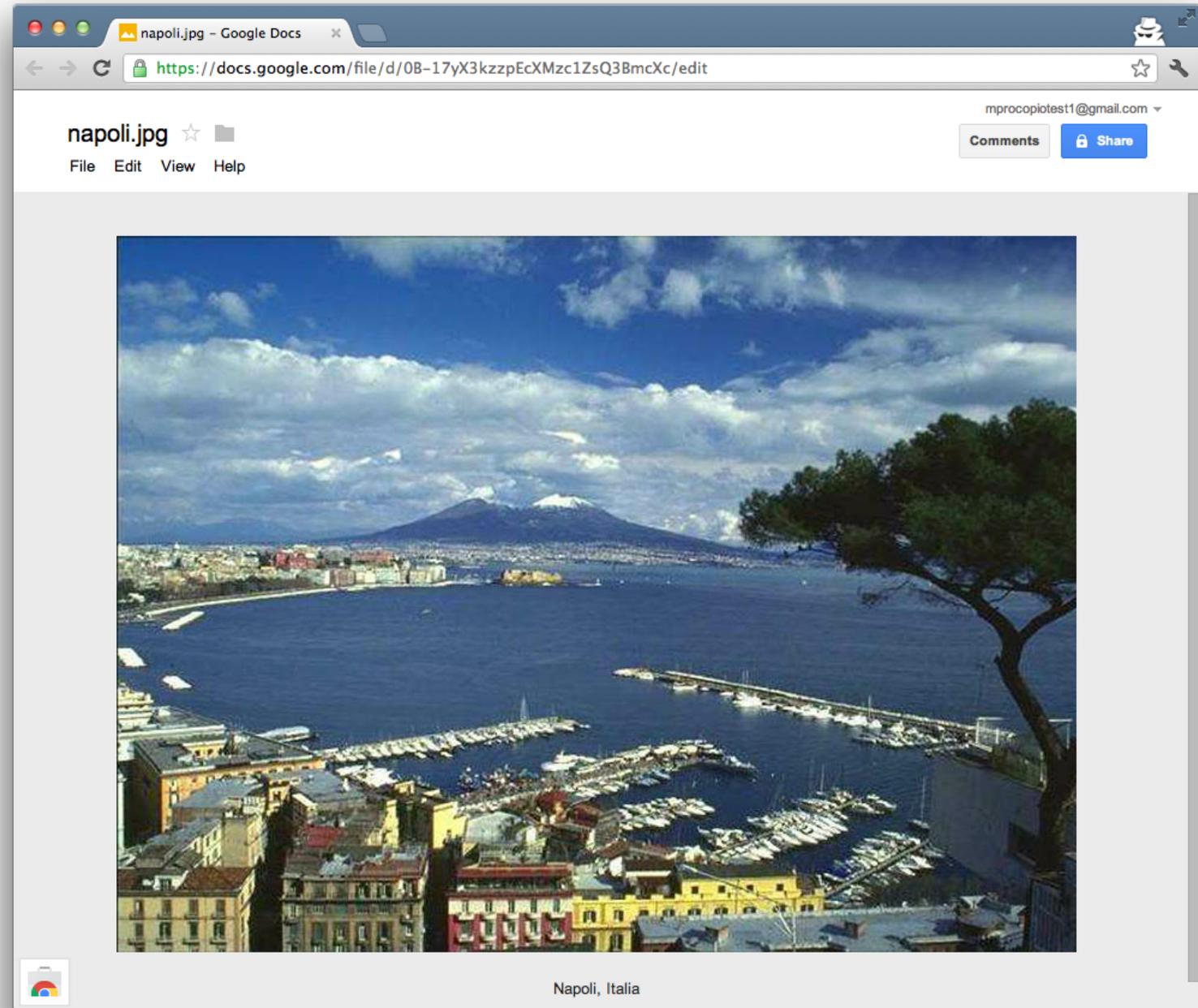
Figure 1 consists of three sub-images: (a) LAGR Robot, showing a small white robot on a grassy field; (b) Typical Scenario, showing a natural outdoor path with trees and rocks; (c) Stereo Perception, showing a color-coded depth map of the scene.

Fig. 1: The LAGR robot (left); sample image from an outdoor scene (center); stereo obtained from onboard cameras (right).



Google Drive Viewer

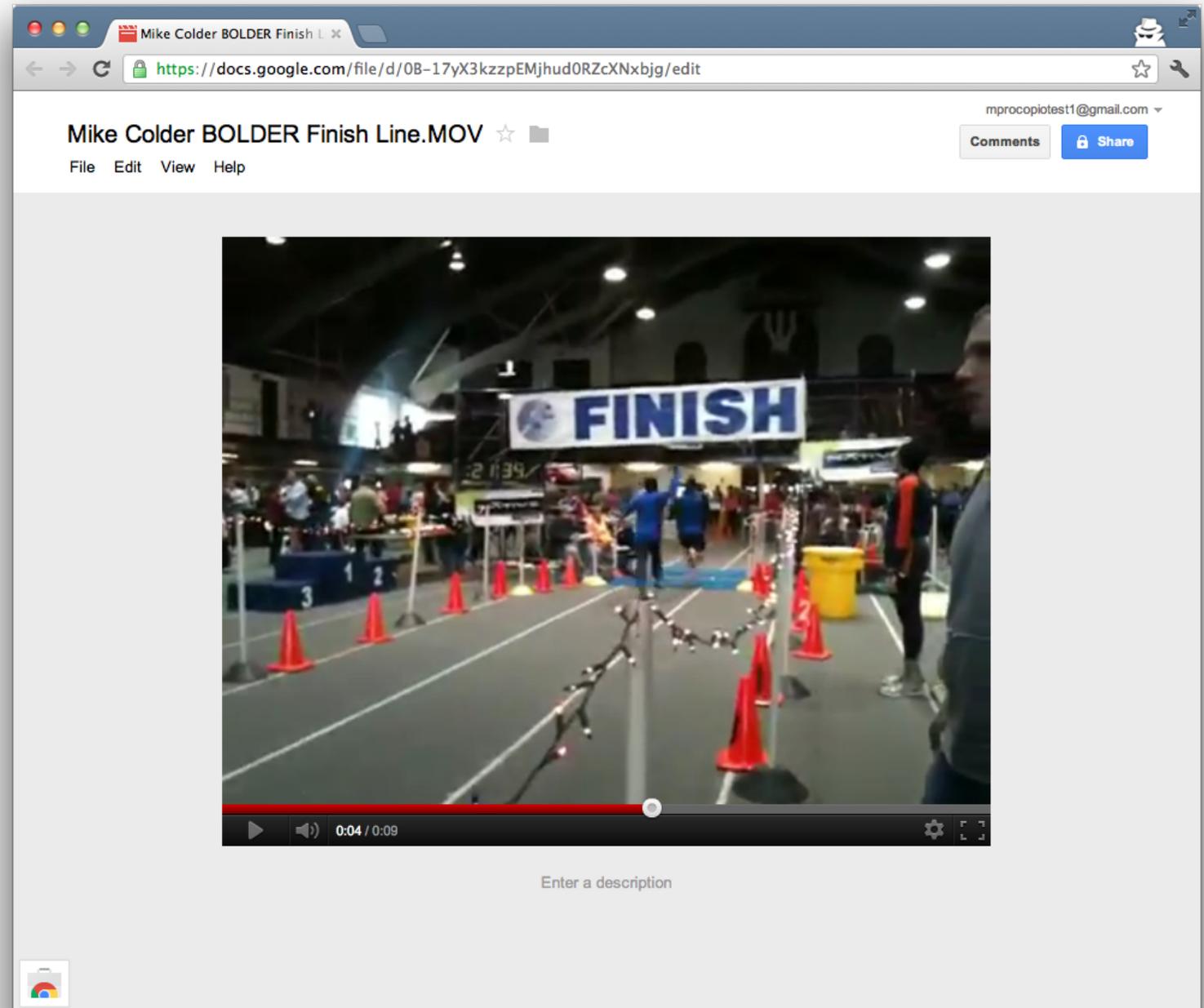
Preview photos of places you wish you were visiting on vacation.



Google Drive Viewer

Watch that video of you getting second place in that 5K over and over.

(But not because you're bitter or anything.)



The screenshot shows a web browser window displaying a Google Drive viewer for a video file named "Mike Colder BOLDER Finish Line.MOV". The browser's address bar shows the URL: <https://docs.google.com/file/d/0B-17yX3kzzpEMjhud0RZcXNxbjg/edit>. The video player shows a scene of a 5K race finish line inside a large indoor arena. A prominent white banner with the word "FINISH" in blue letters is suspended over the track. The track is lined with orange traffic cones and a black stanchion with a white ribbon. Several runners are visible in the distance, and a person in a blue shirt is running towards the camera. The video player interface includes a play button, a volume icon, a progress bar showing 0:04 / 0:09, and a settings icon. Below the video player, there is a text input field with the placeholder "Enter a description".



Built-in Apps and File Previewer - Just a Start

As an ecosystem, we can do better for the user.



HelloFax

Do something useful with that PDF.

Fax your PDFs to all your friends for that ultimate "offline" consumption experience.

The screenshot displays the HelloFax web application interface. The browser address bar shows the URL: https://www.hellofax.com/?is_external_download=1&external_cache_key=ExternalFile_FromUrl_7147403c1562e9f7e43206d...

hello fax

Hi, [mprocopiotest1@gmail.com](#), welcome back!

Send a fax

- 1 Add (and sign) files of any kind**
Drag files here ... [UPLOAD FILES](#) More ▾
procopio_icra2010.pdf [Edit & Sign](#)
TIP
Add your signature, text and checkmarks (optional)
- 2 Enter fax number or email address**
+1 303-555-1212 [United States ▾](#)
[+ Cover page](#) [+ Recipient](#)
 Send high resolution & color version of fax ([learn more](#))

[Send it now](#)

Getting started

Actions

- [Send a fax](#)
- [Sign and send](#)
- [Request signature](#)

Manage

- [Manage your documents](#)

Invite a friend and you'll both get 5 free pages
[INVITE A FRIEND](#)

Need to receive faxes?
[GET A FAX NUMBER TODAY](#)

Earn bonus pages
Progress 0%

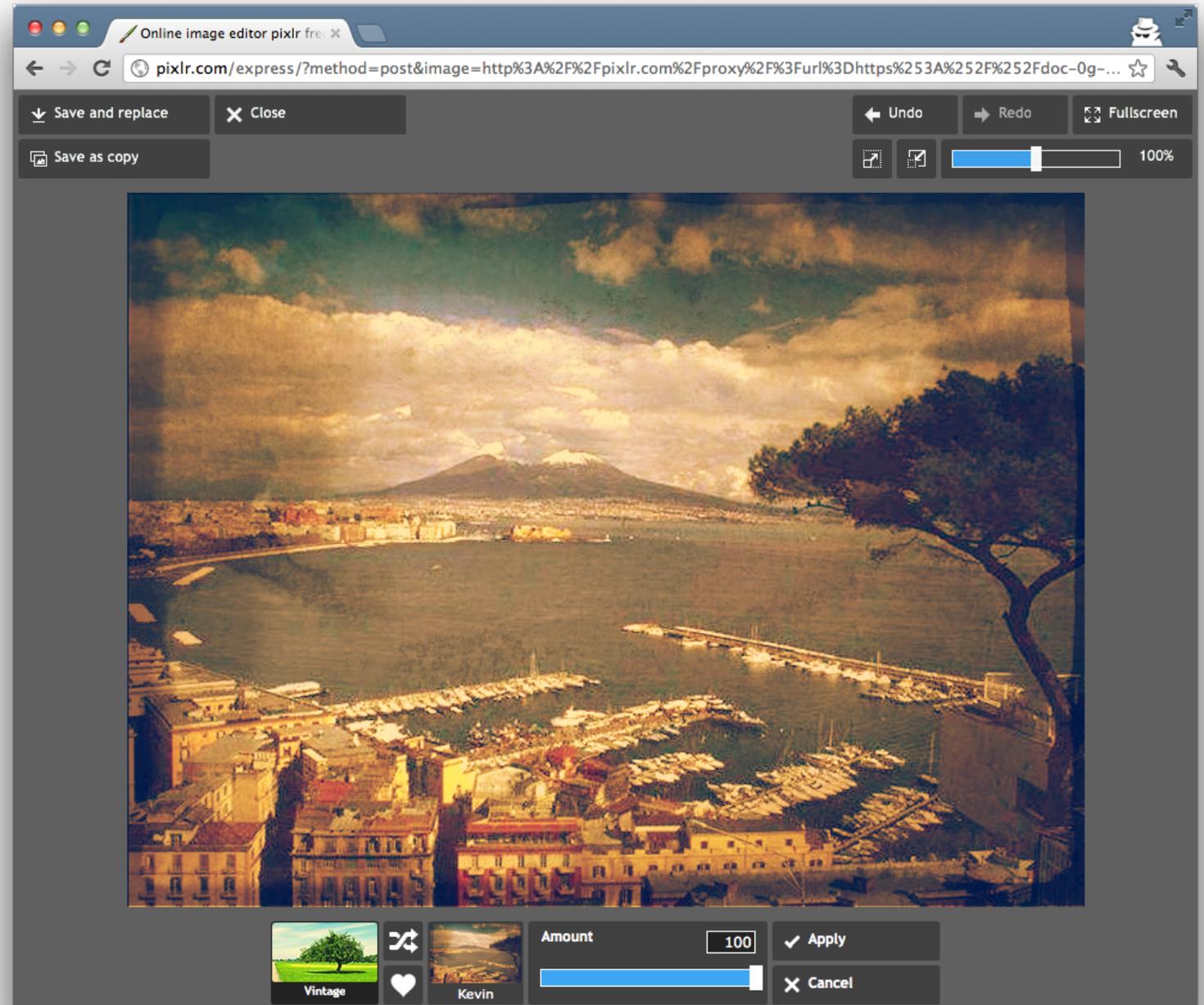
[Feedback / Help](#)



Pixlr Image Editor

Give your photos that vintage look.

(And instantly boost your social networking street cred.)



Pixlr Image Editor

Give your photos that vintage look

(And instantly boost your social networking street cred.)

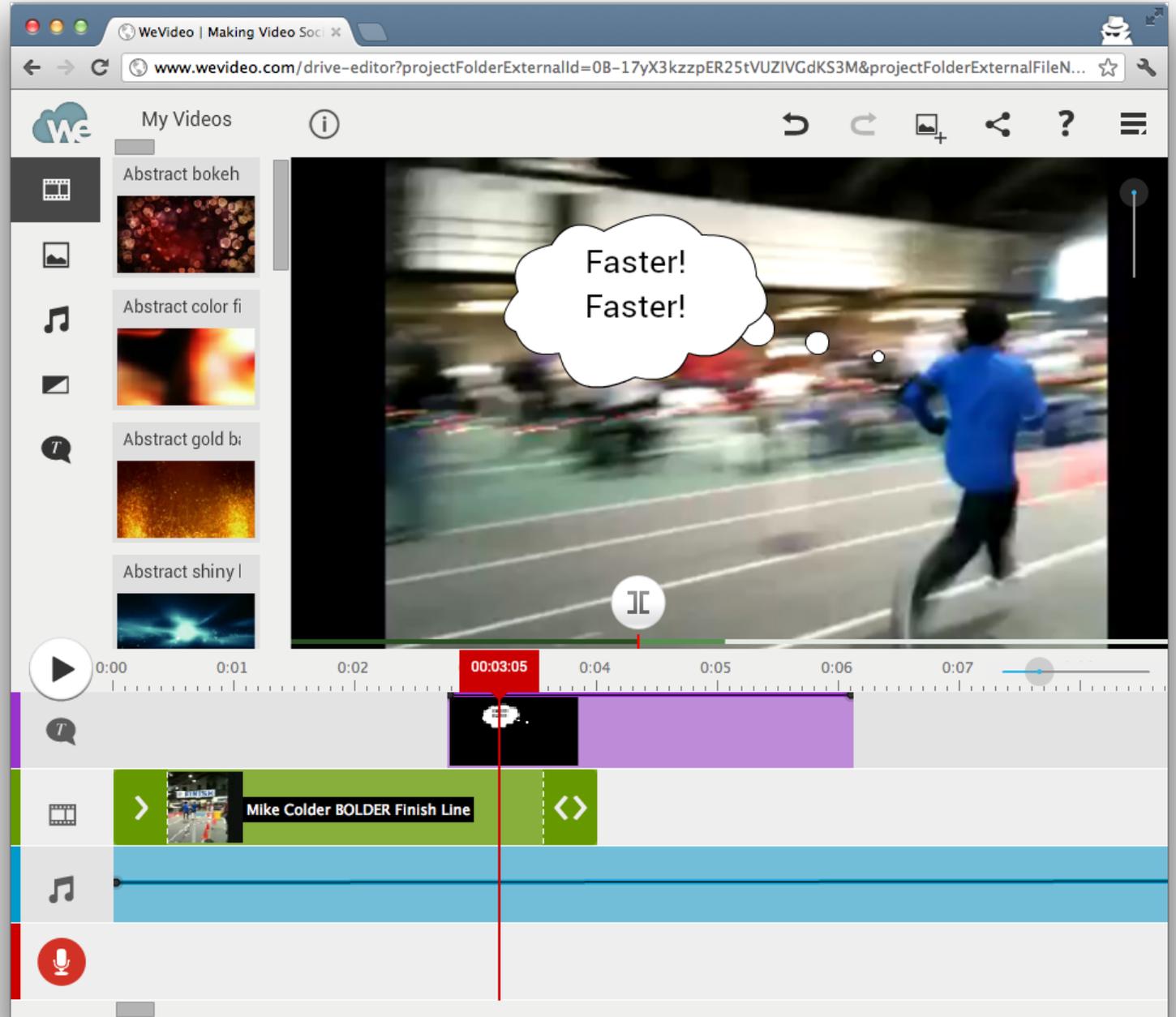
Or make lolcat memes. Your choice.



WeVideo

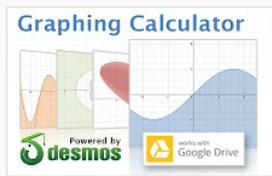
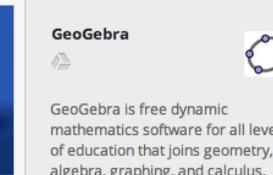
Don't just watch video. Edit it.

(Your friends don't need to know you only got second place...)



Apps bring life to the ecosystem

Fax | Edit | Render | Graph | Draw | Diagram | Sign | Publish | Map | Chart | Listen | Mock | Plan

 <p>AutoCAD WS ★★★★★</p>	 <p>Lucidchart: Diagramming 397,018 users</p>	 <p>Graphing Calculator by Desmos 138,340 users</p>	 <p>Pixlr Editor ★★★★★</p>	 <p>Read books Breader for Google Drive 12,055 users</p>	 <p>Aviary for Google Drive 26,871 users</p>	 <p>Pixorial Video 10,838 users</p>	 <p>Maps Jedi ★★★★★</p>
 <p>PicMonkey 152,452 users</p>	 <p>SlideRocket 247,869 users</p>	 <p>Loupe ★★★★★</p>	 <p>Gantt ★★★★★</p>	 <p>Balsamiq Mockups 27,934 users</p>	 <p>DocuSign 17,978 users</p>	 <p>InstallFree Nexus with Microsoft Office 11,948 users</p>	 <p>GeoGebra GeoGebra is free dynamic mathematics software for all levels of education that joins geometry, algebra, graphing, and calculus. + ADD TO CHROME</p>
 <p>Floorplanner 104,674 users</p>	 <p>WeVideo for Google Drive ★★★★★</p>	 <p>Marqueed ★★★★★</p>	 <p>HelloFax - Free Online Faxing ... 80,832 users</p>	 <p>InstallFree Nexus with LibreOffice ★★★★★</p>	 <p>RightSignature 3,571 users</p>	 <p>Diagramly ★★★★★</p>	 <p>DriveTunes 1,637 users</p>
 <p>Smartsheet Project Management 64,296 users</p>	 <p>Pixlr Express 88,098 users</p>	 <p>MindMeister 68,248 users</p>	 <p>OAuth 2.0 Playground ★★★★★</p>	 <p>Revisu ★★★★★</p>	 <p>Lulu One-Click Publishing ★★★★★</p>	 <p>tottepost ★★★★★</p>	 <p>Lucidchart for Education 1,854 users</p>



Integrate with the Google Drive SDK

Create | Open | Manage | Search | Share | Add Revisions

Manage apps

The following apps have been added to Drive. [Get more apps](#) [Learn more](#)

-  **AutoCAD WS**
 Use by default Options ▾
-  **Balsamiq Mockups**
 Use by default Options ▾
-  **HelloFax - Free Online Faxing & Signing** Options ▾
-  **Loupe** Options ▾
-  **Pixlr Express** Options ▾

OK

Drive

+ people Folder Trash Search More ▾

CREATE 

- Document
- Presentation
- Spreadsheet
- Form (Freebird)
- Form
- Drawing
- Folder
- More ▾
- From template...

My Drive > Working

TITLE
 napolj.jpg
 Lorem Ipsum
 Lorem Ipsum
 Lorem Ipsum
 Table (beta)
 HelloFax - Free Online Faxing & Signing
 Loupe Collage
 Pixlr Express
 Pixorial Video
 WeVideo for Google Drive
 Wireframe (with Balsamiq Mockups)
Get more apps

Drive

+ people Folder Trash Search More ▾ Sort ▾

CREATE 

- My Drive
 - Folder Test
 - Test Video
 - Working**
- Shared with me
- Starred
- Recent
- More ▾

My Drive > Working

TITLE	OWNER
<input checked="" type="checkbox"/>  napolj.jpg	me
<input type="checkbox"/>  Lorem Ipsum	me
 Google Drive Viewer	me
 HelloFax - Free Online Faxing & Signing	me
 Pixlr Express	me
Get more apps	
<input type="checkbox"/>  NEW FOLDER	

- Open
- Open with ▾
- Share... ▾
- Add star
- Don't show in Activity list
- Organize...
- Rename...
- Mark as unviewed

Download Google Drive



Build Awesome Apps

Vibrant and Polished

- Apps that:
 - Are secure
 - Put the user first
 - Integrate well with Drive
- Let's look at 9 things you can do to get there.





Here's how to make your app rock



UX matters

“*A foolish consistency* is the hobgoblin of little minds”

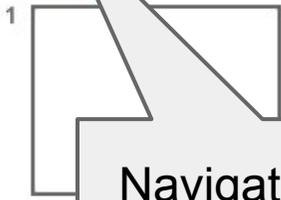
Ralph Waldo Emerson



2/3

users
struggled with
basic tasks
like renaming
files!





File Info

Account Info

Collaboration

Navigation & File operations

Content

Click to add title

Click to add subtitle



Lucidchart





Go mobile

Drive is mobile

Access anywhere. Web, phone, tablet, Chrome OS.



Companion Mobile Apps: Use your app anywhere

Native App experience





Open anywhere

Select a file



Google Docs

Upload



Select

Cancel



Picker

```
<script src="http://www.google.com/jsapi"></script>
```

HTML

```
google.setOnLoadCallback(initPicker);
google.load('picker', '1');

function initPicker() {
  ... // Library ready
}

function showPicker() {
  var picker = new google.picker.PickerBuilder()
    .addView(new google.picker.DocView())
    .setCallback(pickerCallback)
    .setAppId(YOUR_APP_ID)
    .build();
  picker.setVisible(true);
}

function pickerCallback(data) {
  if (data[google.picker.Response.ACTION] == google.picker.Action.PICKED) {
    // Do something!
  }
}
```

JS





Be secure

Scopes with the Google Drive SDK

Full, file-specific, apps, read-only

Scope	Meaning
https://www.googleapis.com/auth/drive.file	Per-file access to files created or opened by the app
https://www.googleapis.com/auth/drive	Full, permissive scope to access all of a user's files. Request this scope only when it is strictly necessary.
https://www.googleapis.com/auth/drive.apps	Allows apps access to the list of Drive apps a user has installed.
https://www.googleapis.com/auth/drive.readonly	Allows read-only access to file metadata and file content
https://www.googleapis.com/auth/drive.readonly.metadata	Allows read-only access to file metadata, but does not allow any access to read or download file content



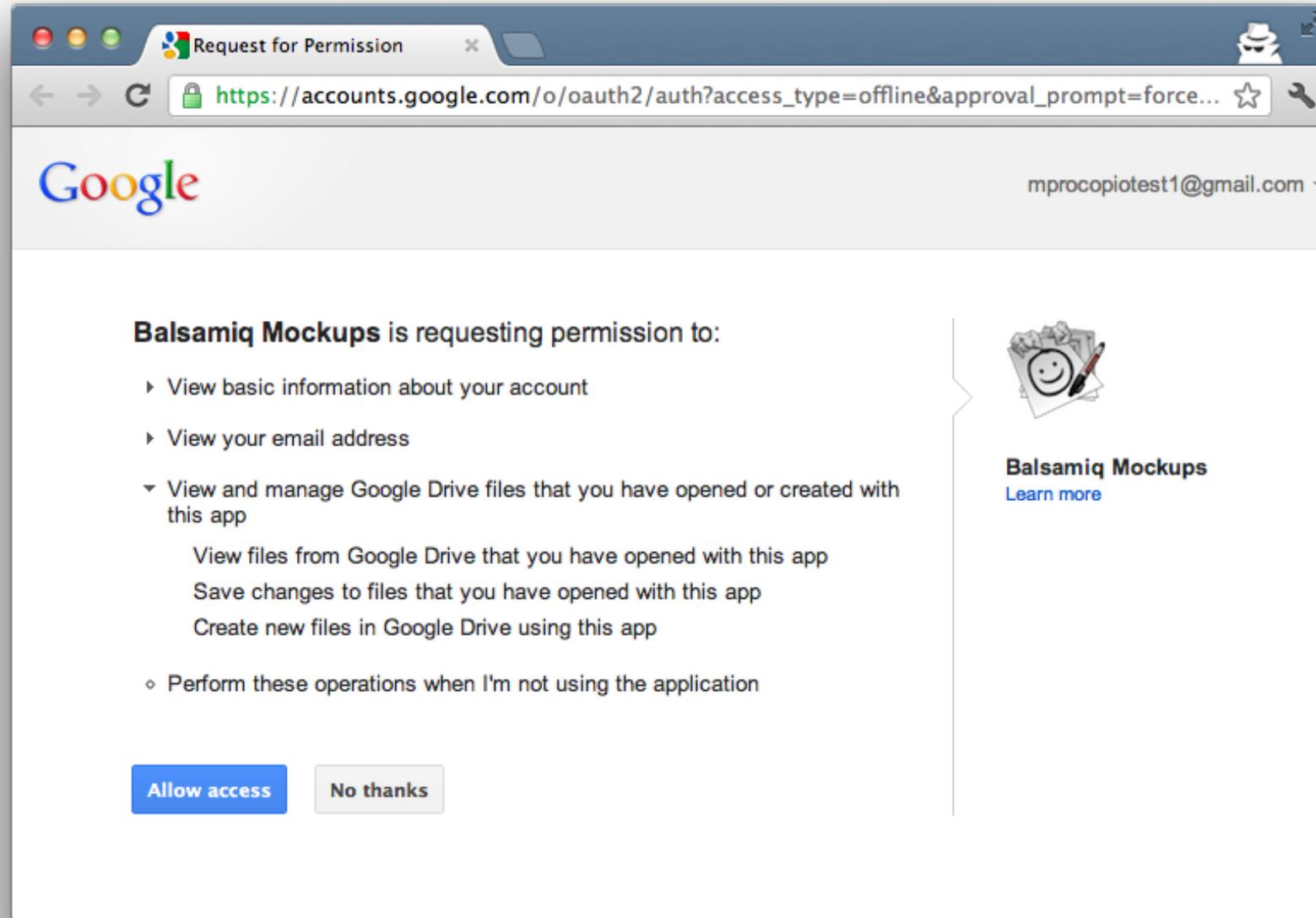
Scopes with the Google Drive SDK

Narrow File-Specific Scope is best for you and your users

Scope	Meaning
https://www.googleapis.com/auth/drive.file	Per-file access to files created or opened by the app
https://www.googleapis.com/auth/drive	Full, permissive scope to access all of a user's files. Request this scope only when it is strictly necessary.
https://www.googleapis.com/auth/drive.apps	Allows apps access to the list of Drive apps a user has installed.
https://www.googleapis.com/auth/drive.readonly	Allows read-only access to file metadata and file content
https://www.googleapis.com/auth/drive.readonly.metadata	Allows read-only access to file metadata, but does not allow any access to read or download file content



Example Authorization Flow



New File-Specific Scope

Authorization text

Google OAuth 2.0 Playground is requesting permission to:

- ▼ View and manage Google Drive files that you have opened or created with this app

View files from Google Drive that you have opened with this app

Save changes to files that you have opened with this app

Create new files in Google Drive using this app



New File-Specific Scope - Demo





Make sharing *easy*

Sharing settings

Link to share (only accessible by collaborators)

<https://docs.google.com/presentation/d/1RDZSP3ullipCqkCxEx3yNp5iCBGzb5HSrD6TlxDHaxA/edit>

Who has access

	Private - Only the people listed below can access	Change...
	Steven Bazyl (you) sbazyl@google.com	Is owner

Add people:

Enter names, email addresses, or groups...

Editors will be allowed to add people and change the permissions. [\[Change\]](#)

Done





Sharing

```
<script src="https://apis.google.com/js/client.js" ></script>
```

HTML

```
gapi.load('drive-share', initSharing);
```

```
function initSharing() {  
  .. // Library loaded  
}
```

```
function share(docId) {  
  var client = new gapi.drive.share.ShareClient(YOUR_APP_ID);  
  client.setItemIds([docId]);  
  client.showSettingsDialog();  
}
```

JS





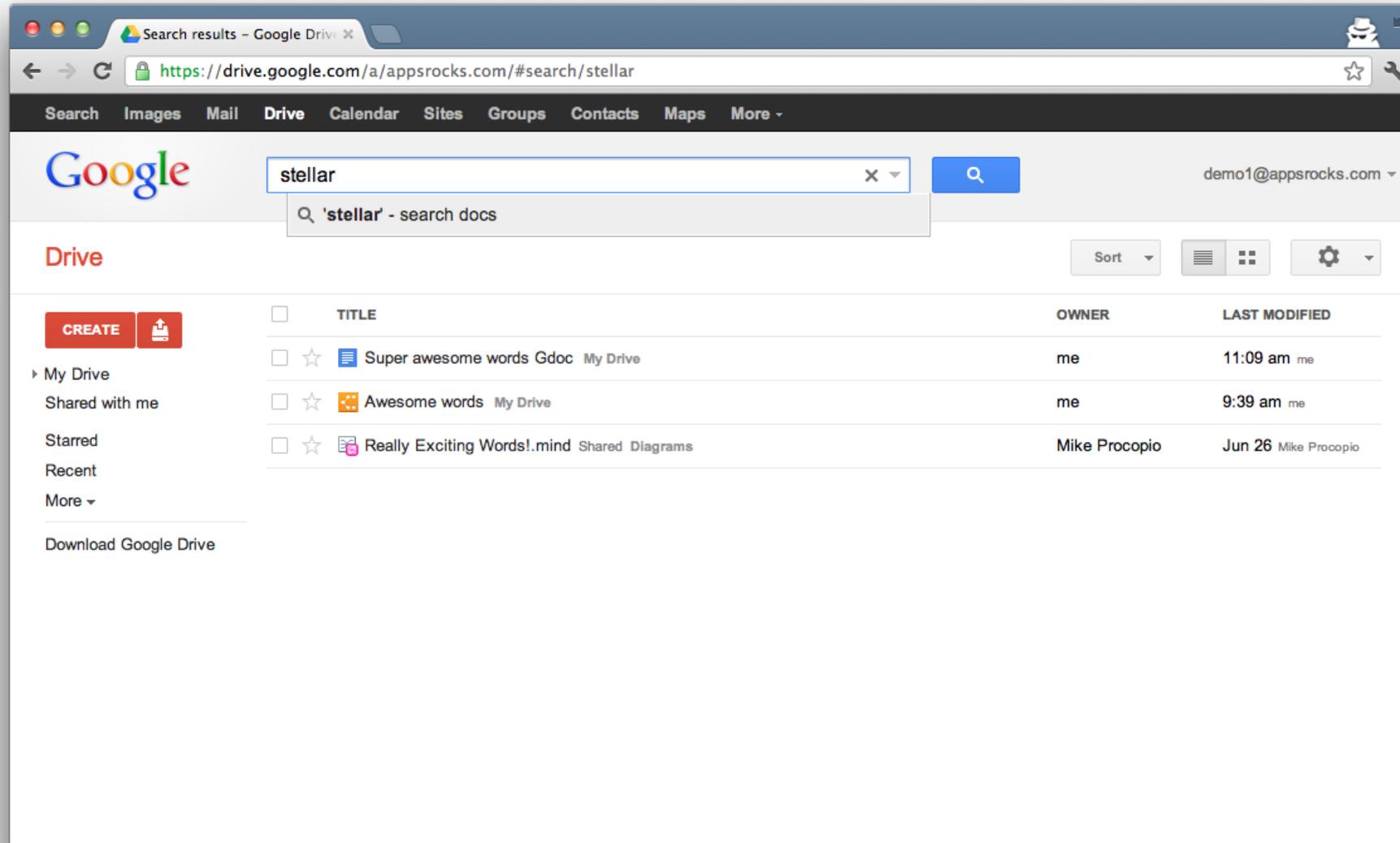
Be searchable

Setting IndexableText - Demo

Make the files created with your app discoverable with search!



Setting IndexableText - Demo (Backup)



The screenshot shows a web browser window displaying Google Drive search results for the term "stellar". The address bar shows the URL <https://drive.google.com/a/appsrocks.com/#search/stellar>. The Google logo is visible on the left, and the search bar contains the text "stellar". A dropdown menu below the search bar shows the suggestion "Q 'stellar' - search docs". The user's email address, "demo1@appsrocks.com", is displayed in the top right corner.

The main content area shows a list of search results under the heading "Drive". The results are organized into columns: "TITLE", "OWNER", and "LAST MODIFIED".

<input type="checkbox"/>	TITLE	OWNER	LAST MODIFIED
<input type="checkbox"/>	☆ Super awesome words Gdoc My Drive	me	11:09 am me
<input type="checkbox"/>	☆ Awesome words My Drive	me	9:39 am me
<input type="checkbox"/>	☆ Really Exciting Words!.mind Shared Diagrams	Mike Procopio	Jun 26 Mike Procopio

On the left side of the interface, there are navigation options: "CREATE" (with a plus icon), "My Drive", "Shared with me", "Starred", "Recent", "More" (with a dropdown arrow), and "Download Google Drive".



Setting IndexableText - Demo (Backup)

The screenshot displays the MindMeister web application interface. The central focus is a mind map with a central node labeled "Spectacular" in a blue rounded rectangle. Eight branches radiate from this central node, each ending in a white rounded rectangle containing an adjective: "Stunning" (with a smiley face icon), "Fabulous" (with a flag icon), "Fab", "Stellar" (with a brown briefcase icon), "Phenomenal", "Marvelous" (in pink text), "Extraordinary" (with a line graph icon), and "Astounding".

The interface includes a blue toolbar at the top with icons for navigation and editing, and the MindMeister logo. The right sidebar contains a "Properties" panel with "Format" options (font size, bold, italic, color) and "Icons & Images" options (recent icons, image insertion). Below this is a "Notes" section with a yellow background and a search bar. The bottom status bar shows "Currently editing: No one else is editing this mind map" and a search field.





Save early, save often

4/5

users
assumed
their work
was auto-
saved



Autosave complexities

Mutations vs. Blobs
Quota vs. Timeliness
Frequency vs. History



Autosave psuedocode

```
var autosaver = setInterval(function() {  
  if (dirty()) {  
    var newRev = timeSinceLastSave() > HOUR; // Been a while...  
    save(newRev); // New revision  
  }  
}, 30000); // Autosave every 30 seconds if dirty  
  
$('#saveButton').click(function() {  
  save(true); // Explicit save, create new revision  
});
```

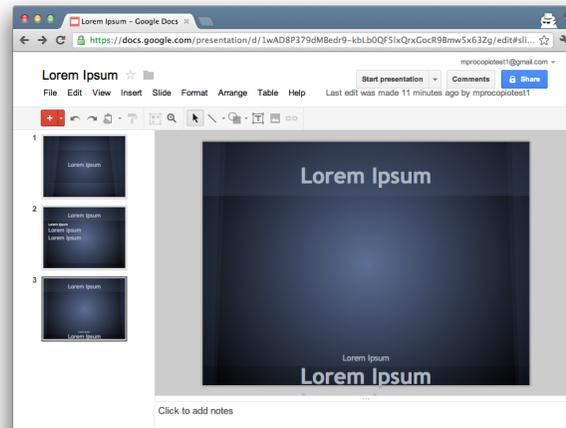
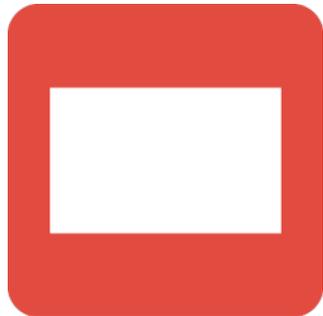
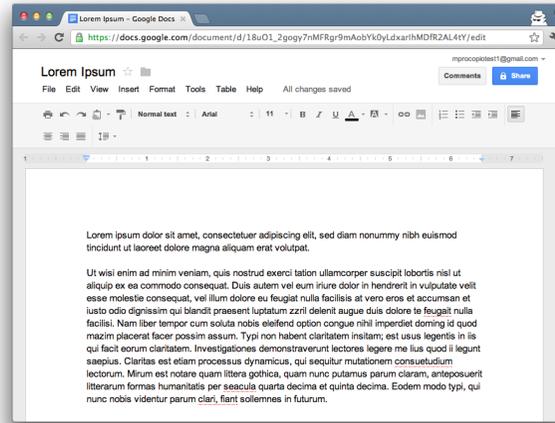
JS





Open Google Docs Types

Directly Open Google Docs with your App



Example Export Formats

Google Doc Format	Conversions Format	Corresponding MIME type
Documents	HTML	text/html
	Plain text, Rich text	text/plain, application/rtf
	Open Office doc	application/vnd.oasis.opendocument.text
	PDF	application/pdf
Spreadsheets	MS Excel	application/vnd.ms-excel
	Open Office sheet	application/x-vnd.oasis.opendocument.spreadsheet
Drawings	JPEG, PNG, SVG	image/jpeg, image/png, image/svg+xml
	PDF	application/pdf
Presentations	MS PowerPoint	application/vnd.openxmlformats-officedocument.presentationml.presentation
	Open Office, PDF	application/pdf



Setting up your app for this is simple

In APIs Console, Specify your MIME types, check the "Import" checkbox

Default MIME Types

List MIME types that your application can open. Users can make your application open files with these MIME types by default.

1. ×
2.

Import

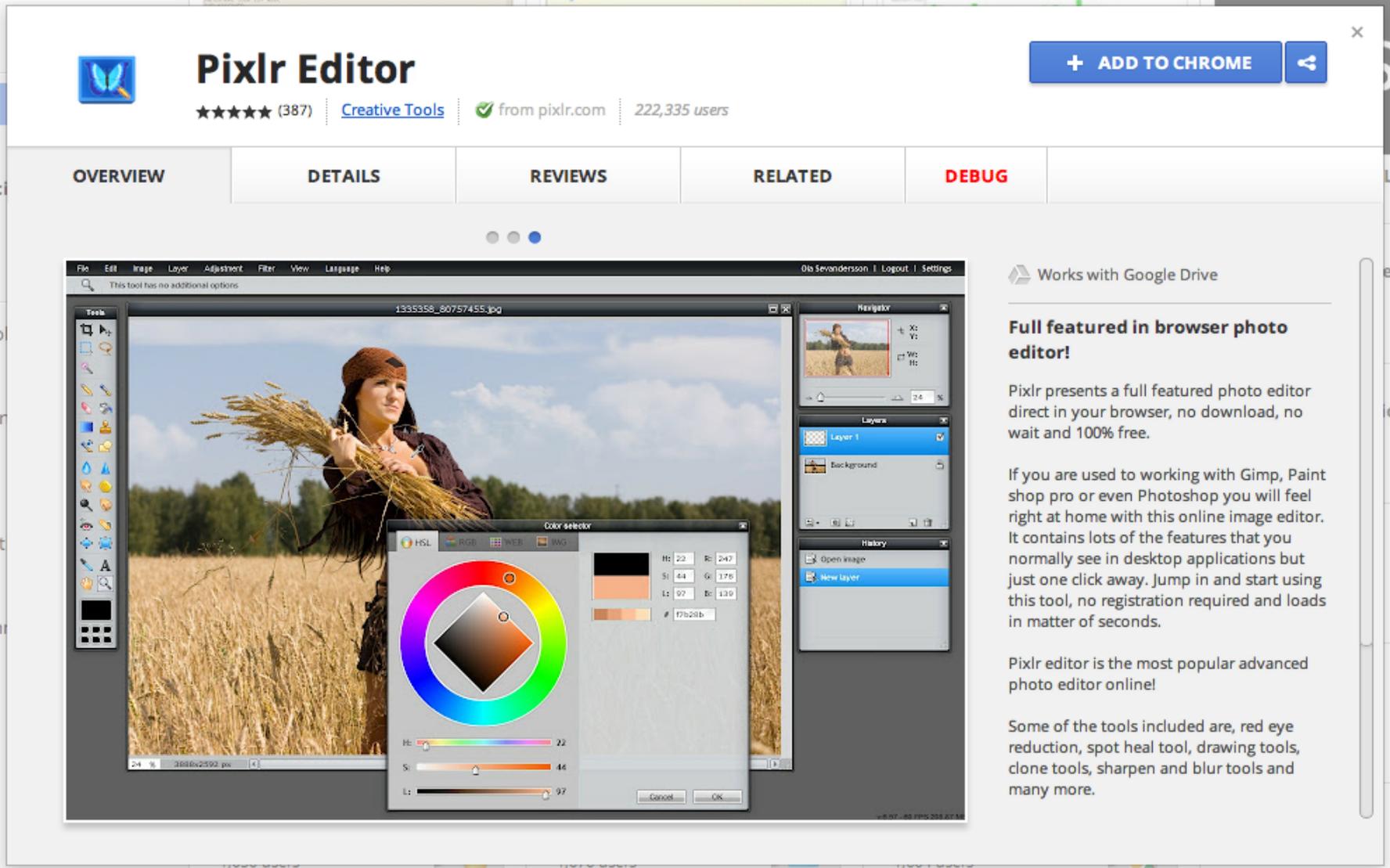
Allow users to open files that can be converted to a format that this app can open





Be discoverable

The CWS page is your chance to sell your app!



Pixlr Editor

★★★★★ (387) | [Creative Tools](#) | from pixlr.com | 222,335 users

+ ADD TO CHROME

OVERVIEW | DETAILS | REVIEWS | RELATED | **DEBUG**

Works with Google Drive

Full featured in browser photo editor!

Pixlr presents a full featured photo editor direct in your browser, no download, no wait and 100% free.

If you are used to working with Gimp, Paint shop pro or even Photoshop you will feel right at home with this online image editor. It contains lots of the features that you normally see in desktop applications but just one click away. Jump in and start using this tool, no registration required and loads in matter of seconds.

Pixlr editor is the most popular advanced photo editor online!

Some of the tools included are, red eye reduction, spot heal tool, drawing tools, clone tools, sharpen and blur tools and many more.



Viral adoption



No preview available

This item was created with **Balsamiq Mockups**, a Google Drive app.

By installing the app, you will get access to all of its features, including preview.

Install app

Download

[Get more apps](#)

Enter a description



Declaring file types

Chrome Web Store Manifest Example

```
"intents": {  
  "http://drive.google.com/intents/opendrivedoc": [  
    {  
      "type": ["text/plain",  
              "application/vnd.google.drive.ext-type.txt"],  
      "href": "https://www.yourapp.com/",  
      "title": "Open",  
      "disposition" : "window"  
    }  
  ]  
},  
...
```

HTML





Quick Recap

Recap

Nine things you can do to make your app **rock**:

1. Be consistent (UX matters)
2. Go mobile
3. Make sharing easy
4. Be secure
5. Open anywhere
6. Be searchable
7. Save early, save often (autosave)
8. Open Google Docs types
9. Be discoverable





Opportunity

What are you going to build?

Zillions of files stored in Drive...

Files of all types

Images

Videos

PDFs

Documents, Spreadsheets, and Presentations

Text and RTF files

HTML, XML and CSS

ZIP and RAR archives

Source code: JS, Java, PHP, Python, C#

How can we bring life to these files?

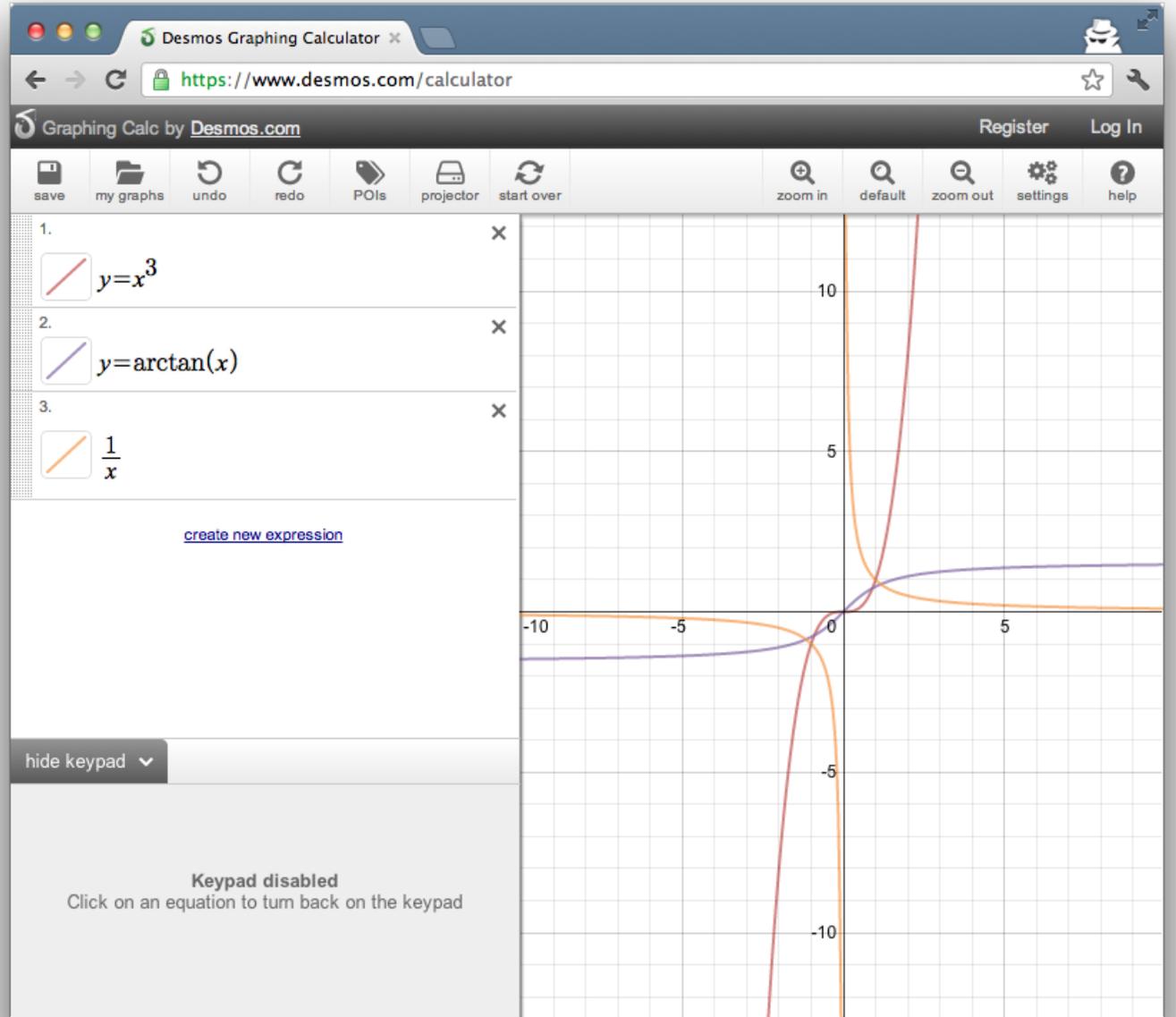
If we needed an app in the desktop days... we need it now in the cloud!



Add your own file type

Build new types of apps

- These apps are more about the capability, the experience...
- And less about the actual file (although state is stored in Drive).



We're here for you

Developer advocates & engineers standing by to accept your donation feature request



developers.google.com/drive

[google-drive-sdk](https://stackoverflow.com/questions/tagged/google-drive-sdk) on Stack Overflow

The screenshot shows the Google Developers website for the Google Drive SDK. The page title is "Google Drive SDK" with a "1k" badge. The main heading is "Integrate your app with Google Drive". Below this, there are three bullet points: "Instantly reach millions of users", "Let users store, create, and open files anywhere", and "Leverage Google sharing, storage, and identity". There is a section titled "works with Google Drive" showing logos for various services like Q, Hello, and others. At the bottom, there are four columns: "How Apps Work", "Get Started", "See Examples", and "API Reference".

The screenshot shows the Stack Overflow website for the "google-drive-sdk" tag. The page title is "Newest 'google-drive-sdk'". The main heading is "Tagged Questions" with a "168 questions tagged" badge. There are several question cards visible, including "How to POST a large file (> 5 mb) from Blobstore to Google Drive?", "Append mode on Google Drive", and "Application to write files to our customers' google drive".



<Thank You! />



Get started with the SDK:
developers.google.com/drive

Get help on the Stack Overflow forum:
<http://stackoverflow.com/questions/tagged/google-drive-sdk>



Discover and install apps:
https://chrome.google.com/webstore/category/collection/drive_apps

And... Come and talk to us now!

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