

106-2: EE4052

通識課程：

計算機程式設計 之旅

Computer Programming

Unit 03: 設定軟體 R 與 RStudio

連 豐 力

臺大電機系

Feb 2018 - Jun 2018

大綱

- R 的故事
- 安裝軟體：
 - R 軟體
 - The R Project for Statistical Computing
 - <https://www.r-project.org/>
 - RStudio 軟體
 - RStudio
 - <https://www.rstudio.com/>
- 軟體使用方式：
 - 主要方式 與 次要方式
- 程式測試：
 - 工作目錄，數據資料，繪圖，存檔

R 程式語言的故事

- R 程式語言是一套提供：數據處理，計算與圖形處理的軟體發展環境。
- R 程式語言也可以當作一般的高階程式語言來使用，類似 C++ 或 Java。

- 歷史脈絡：

- SPSS, SAS

- S 語言：1976年

- 貝爾實驗室 **John Chambers**，VAX, Unix
 - 用於提供資料分析使用的程式語言



- R 語言：1992年

- 紐西蘭 奧克蘭大學 **Ross Ihaka** 與 **Robert Gentleman**
 - 用於統計研究的軟體與環境



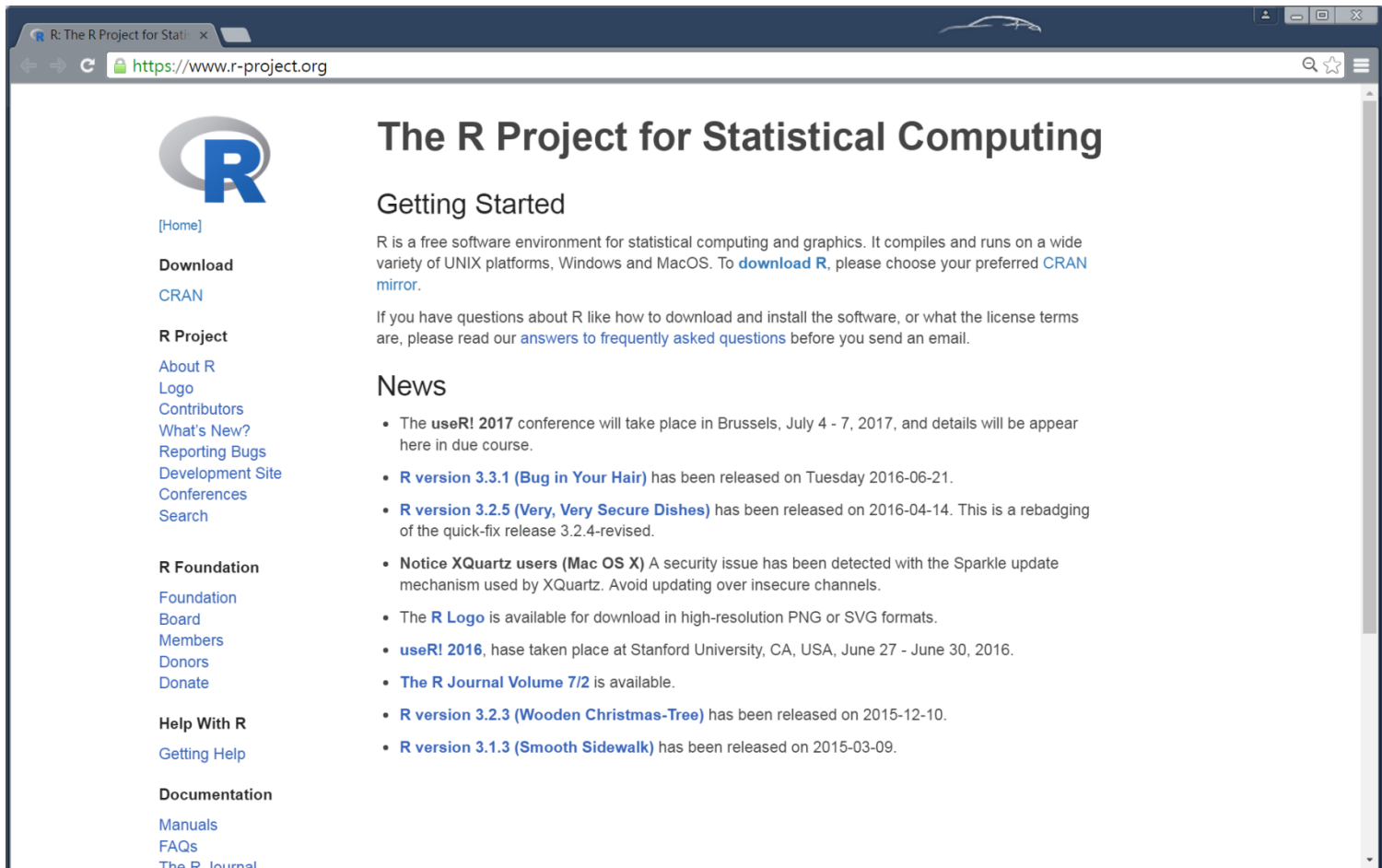
R 程式語言的特點

- 免費軟體，開放原始碼
- 程式設計思想非常簡單，幾乎就和寫公式一樣簡單
- 優勢：資料處理，資料統計，資料視覺化
- 強大的數學統計分析功能：預測，模型與分析
- 強大的科學資料視覺化功能，提供分析及圖形顯示工具
- 擴充套件：5000多個軟體套件，
包含：統計計算，機器學習，金融分析，生物資訊，
社會網路分析自然語言處理等
- 支援電腦系統：Windows, Mac-OS, Linux, 32位元, 64位元
- 支援其他的格式：SAS, SPSS, Matlab, Excel, Access 等

軟體使用方式

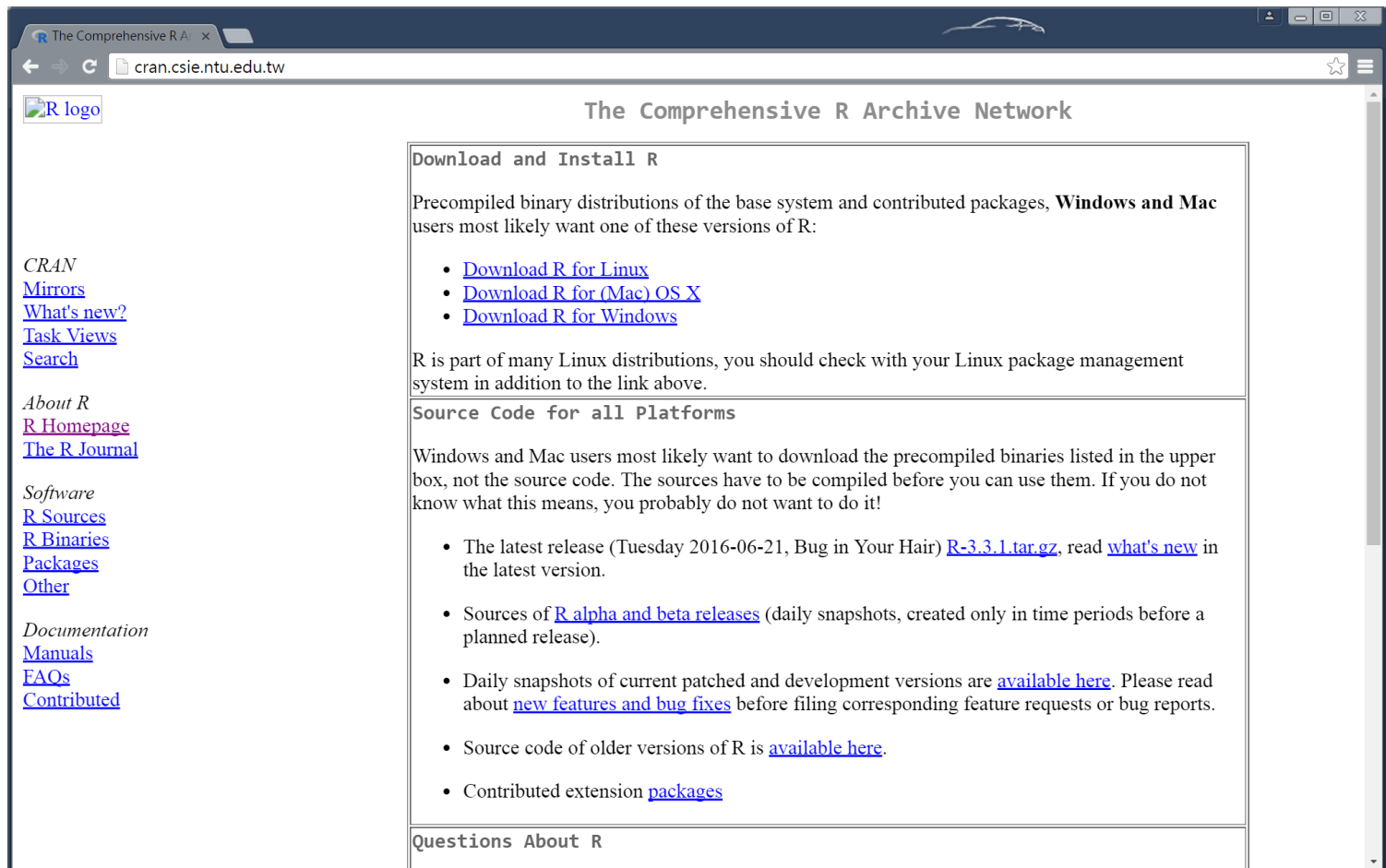
- 軟體使用方式
 - 主要方式
 - 桌機或筆電：Windows, Mac-IOS
 - 次要方式：
 - 平板 app 雲端連線：Android, iPad,
 - 電腦 app 雲端連線：
 - 桌機或筆電或平板 web 雲端連線：
- 安裝軟體：
 - R 軟體
 - The R Project for Statistical Computing
 - <https://www.r-project.org/>
 - RStudio 軟體
 - RStudio
 - <https://www.rstudio.com/>

- The R Project for Statistical Computing
 - <https://www.r-project.org/>



The screenshot shows the homepage of the R Project for Statistical Computing. The browser address bar displays <https://www.r-project.org>. The page features the R logo on the left, followed by navigation links for [Home], Download (CRAN), R Project (About R, Logo, Contributors, What's New?, Reporting Bugs, Development Site, Conferences, Search), R Foundation (Foundation, Board, Members, Donors, Donate), Help With R (Getting Help), and Documentation (Manuals, FAQs, The R Journal). The main content area is titled "The R Project for Statistical Computing" and includes a "Getting Started" section with introductory text and a link to download R. Below this is a "News" section with a list of recent events and releases, including the useR! 2017 conference, R version 3.3.1 (Bug in Your Hair), R version 3.2.5 (Very, Very Secure Dishes), a security issue for XQuartz users, the R Logo download availability, useR! 2016, The R Journal Volume 7/2, R version 3.2.3 (Wooden Christmas-Tree), and R version 3.1.3 (Smooth Sidewalk).

- The Comprehensive R Archive Network
 - <http://cran.csie.ntu.edu.tw/>



The screenshot shows a web browser window displaying the Comprehensive R Archive Network (CRAN) website. The browser's address bar shows the URL cran.csie.ntu.edu.tw. The page title is "The Comprehensive R Archive Network".

The main content area is titled "Download and Install R" and contains the following text:

Precompiled binary distributions of the base system and contributed packages, **Windows and Mac** users most likely want one of these versions of R:

- [Download R for Linux](#)
- [Download R for \(Mac\) OS X](#)
- [Download R for Windows](#)

R is part of many Linux distributions, you should check with your Linux package management system in addition to the link above.

The next section is titled "Source Code for all Platforms" and contains the following text:

Windows and Mac users most likely want to download the precompiled binaries listed in the upper box, not the source code. The sources have to be compiled before you can use them. If you do not know what this means, you probably do not want to do it!

- The latest release (Tuesday 2016-06-21, Bug in Your Hair) [R-3.3.1.tar.gz](#), read [what's new](#) in the latest version.
- Sources of [R alpha and beta releases](#) (daily snapshots, created only in time periods before a planned release).
- Daily snapshots of current patched and development versions are [available here](#). Please read about [new features and bug fixes](#) before filing corresponding feature requests or bug reports.
- Source code of older versions of R is [available here](#).
- Contributed extension [packages](#)

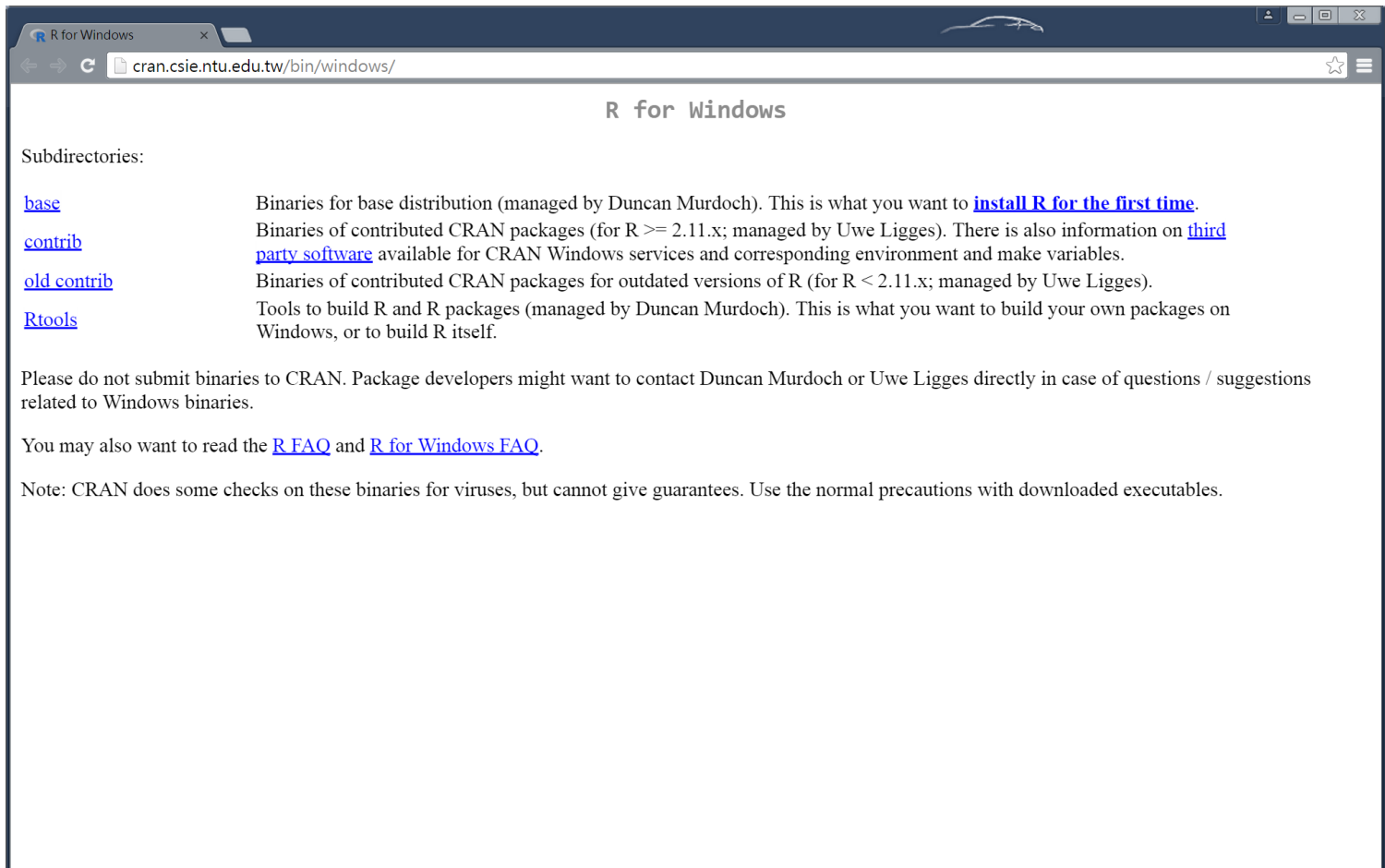
The left sidebar contains navigation links under the following categories:

- CRAN**
 - [Mirrors](#)
 - [What's new?](#)
 - [Task Views](#)
 - [Search](#)
- About R**
 - [R Homepage](#)
 - [The R Journal](#)
- Software**
 - [R Sources](#)
 - [R Binaries](#)
 - [Packages](#)
 - [Other](#)
- Documentation**
 - [Manuals](#)
 - [FAQs](#)
 - [Contributed](#)

At the bottom of the page, there is a section titled "Questions About R".

■ R for Windows

- <http://cran.csie.ntu.edu.tw/bin/windows/>

A screenshot of a web browser window showing the "R for Windows" website. The browser's address bar displays "cran.csie.ntu.edu.tw/bin/windows/". The page title is "R for Windows". Under the heading "Subdirectories:", there are four links with descriptions: "base" (Binaries for base distribution), "contrib" (Binaries of contributed CRAN packages for R >= 2.11.x), "old_contrib" (Binaries of contributed CRAN packages for outdated versions of R), and "Rtools" (Tools to build R and R packages). Below this, there is a paragraph advising not to submit binaries to CRAN and providing contact information for Duncan Murdoch or Uwe Ligges. Another paragraph suggests reading the "R FAQ" and "R for Windows FAQ". A final note states that CRAN checks binaries for viruses but cannot guarantee safety.

R for Windows

Subdirectories:

- [base](#) Binaries for base distribution (managed by Duncan Murdoch). This is what you want to [install R for the first time](#).
- [contrib](#) Binaries of contributed CRAN packages (for R >= 2.11.x; managed by Uwe Ligges). There is also information on [third party software](#) available for CRAN Windows services and corresponding environment and make variables.
- [old_contrib](#) Binaries of contributed CRAN packages for outdated versions of R (for R < 2.11.x; managed by Uwe Ligges).
- [Rtools](#) Tools to build R and R packages (managed by Duncan Murdoch). This is what you want to build your own packages on Windows, or to build R itself.

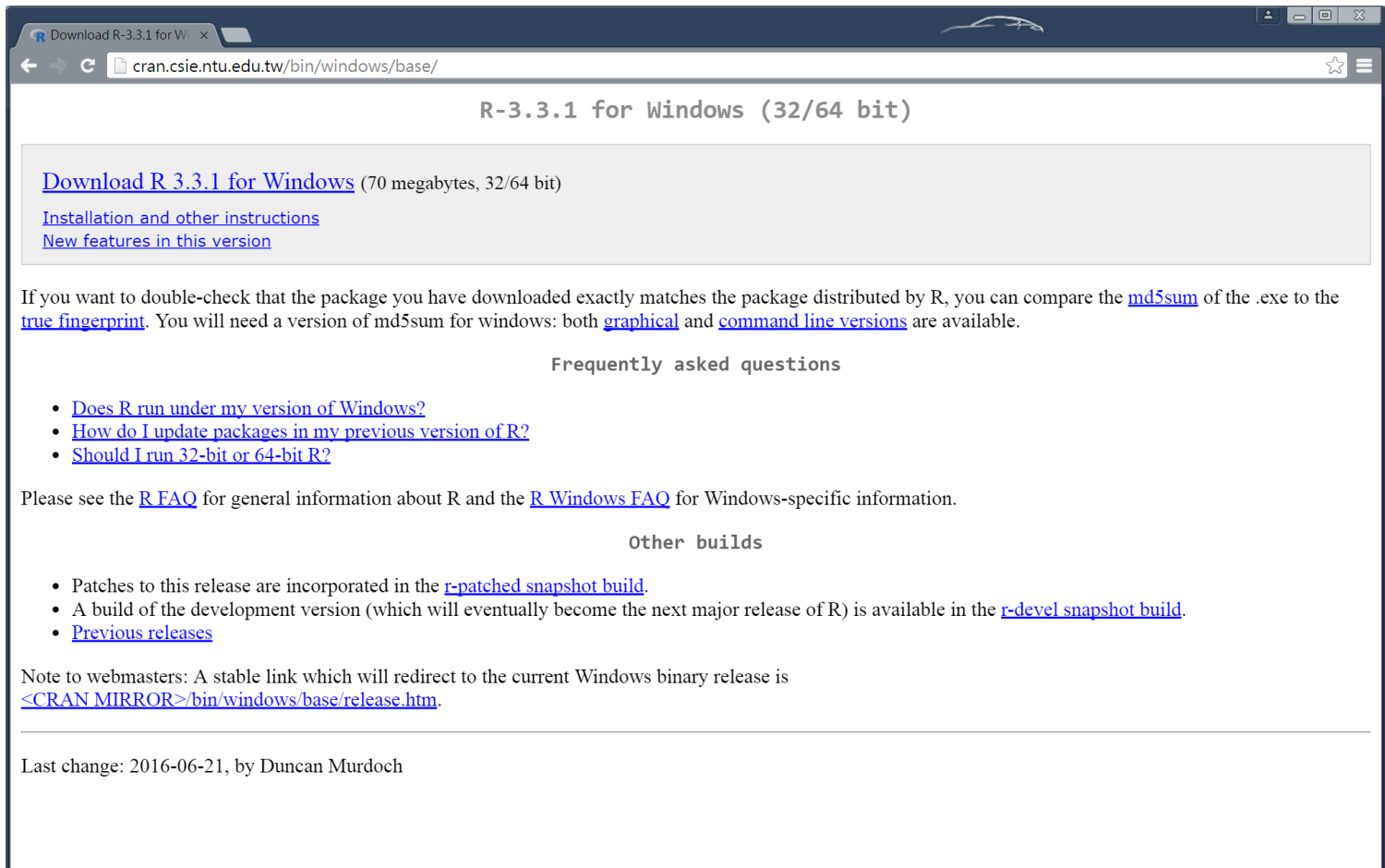
Please do not submit binaries to CRAN. Package developers might want to contact Duncan Murdoch or Uwe Ligges directly in case of questions / suggestions related to Windows binaries.

You may also want to read the [R FAQ](#) and [R for Windows FAQ](#).

Note: CRAN does some checks on these binaries for viruses, but cannot give guarantees. Use the normal precautions with downloaded executables.

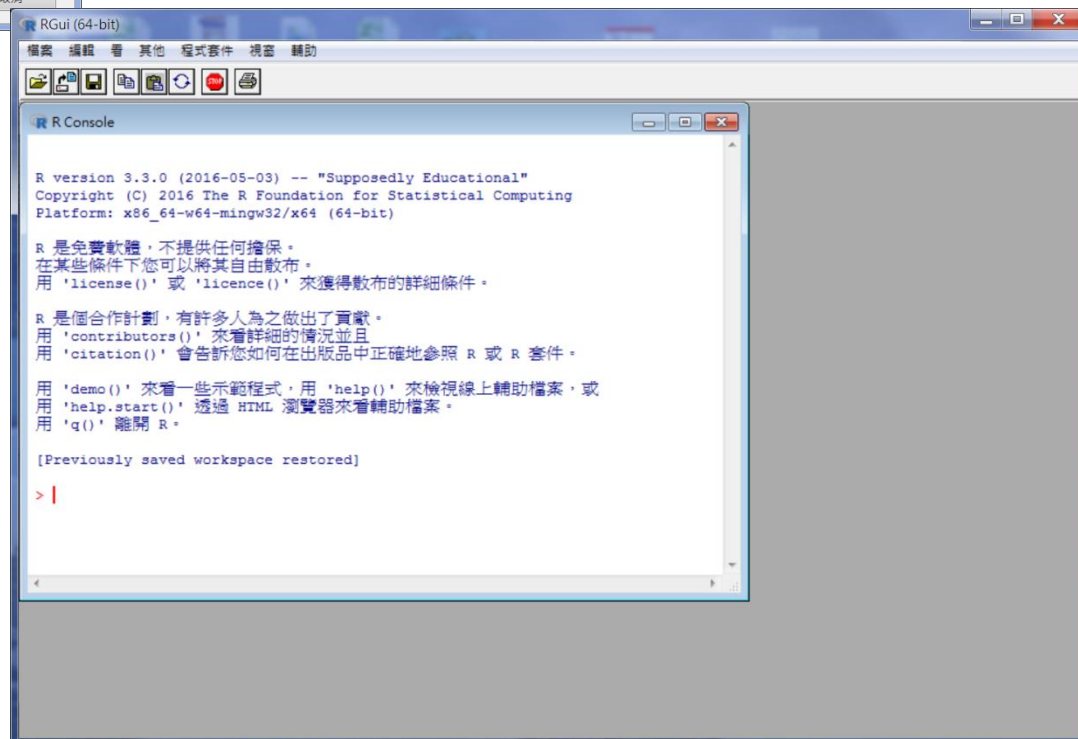
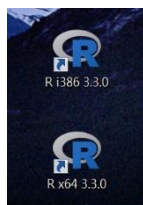
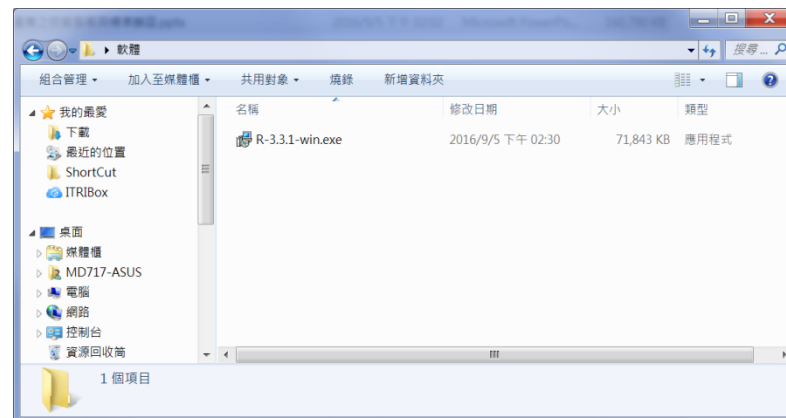
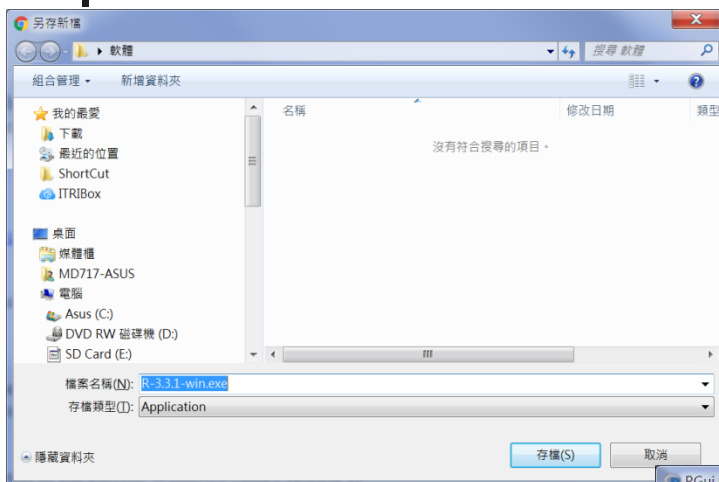
■ R-3.3.x for Windows (32/64 bit)

- <http://cran.csie.ntu.edu.tw/bin/windows/base/>



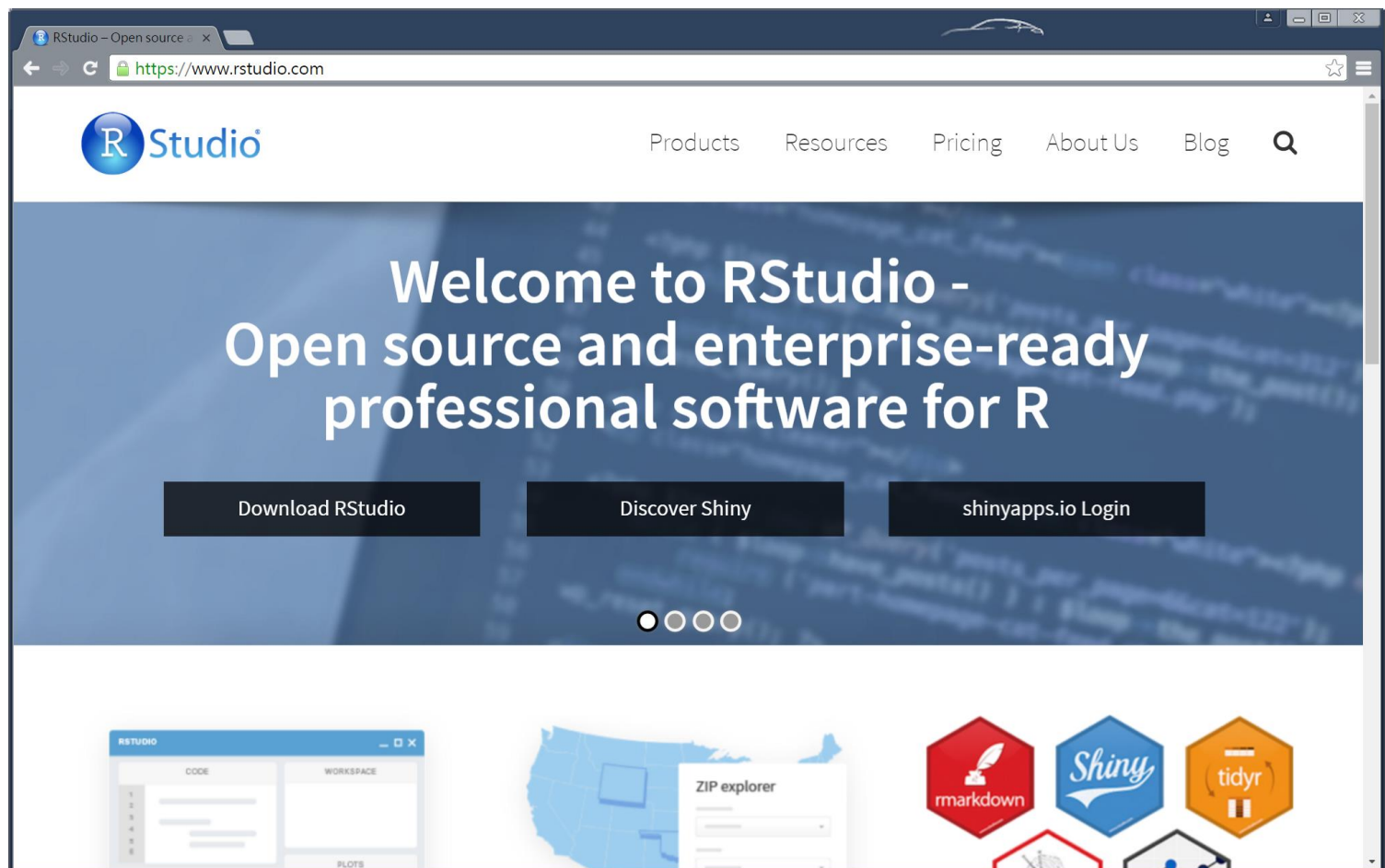
The screenshot shows a web browser window with the address bar displaying `cran.csie.ntu.edu.tw/bin/windows/base/`. The page title is "R-3.3.1 for Windows (32/64 bit)". The main content area features a prominent link: "Download R 3.3.1 for Windows (70 megabytes, 32/64 bit)". Below this link are two smaller links: "Installation and other instructions" and "New features in this version". A paragraph of text follows, explaining how to verify the downloaded package using `md5sum` and providing links to "graphical" and "command line versions". Below this is a section titled "Frequently asked questions" with three bullet points: "Does R run under my version of Windows?", "How do I update packages in my previous version of R?", and "Should I run 32-bit or 64-bit R?". Another paragraph directs users to "R FAQ" and "R Windows FAQ". A section titled "Other builds" contains three bullet points: "Patches to this release are incorporated in the r-patched snapshot build.", "A build of the development version (which will eventually become the next major release of R) is available in the r-devel snapshot build.", and "Previous releases". A note to webmasters at the bottom provides a stable link: `<CRAN MIRROR>/bin/windows/base/release.htm`. The footer of the page states "Last change: 2016-06-21, by Duncan Murdoch".

R 軟體安裝



■ RStudio

- <https://www.rstudio.com/>



■ Rstudio download

- <https://www.rstudio.com/products/rstudio/download3/>

Choose Your Version of RStudio

RStudio is a set of integrated tools designed to help you be more productive with R. It includes a console, syntax-highlighting editor that supports direct code execution, as well as tools for plotting, history, debugging and workspace management. [Learn More](#)

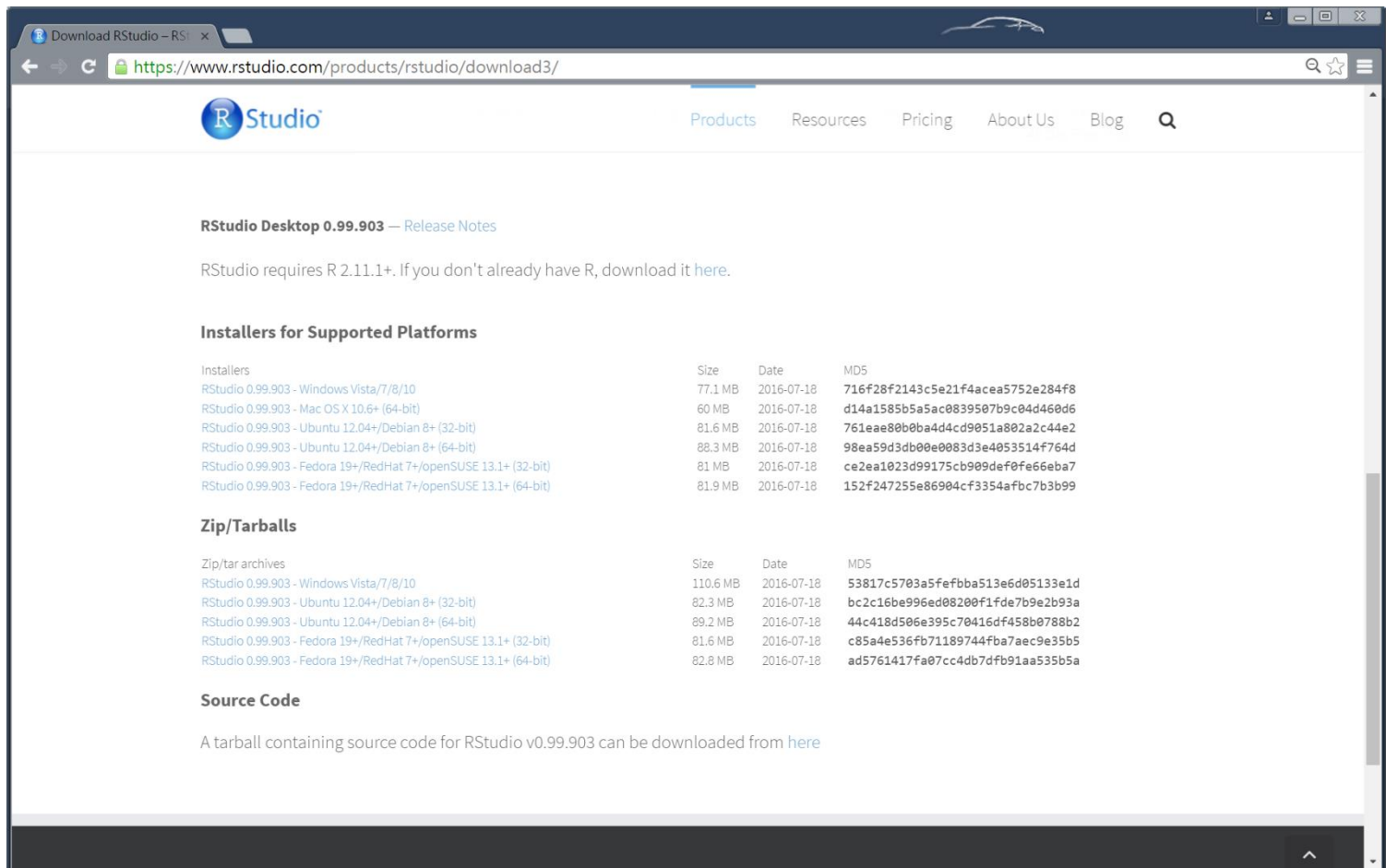
	RStudio Desktop (Free License)	RStudio Desktop (Commercial License)	RStudio Server (Free License)	RStudio Server Pro (Commercial License)
Integrated Development Environment for R	✓	✓	✓	✓
Priority support		✓		✓
Access via Web Browser			✓	✓
Enterprise Security and Access Controls				✓
Project Sharing				✓
Access to Multiple Versions of R				✓
Multiple Concurrent Sessions				✓
Administrative Dashboard				✓
Load Balancing and Resource Management				✓
License	AGPL	Commercial	AGPL	Commercial
Pricing	FREE	\$995/yr*	FREE	\$9,995/yr*

DOWNLOAD BUY NOW DOWNLOAD DOWNLOAD

[Learn More](#) [Learn More](#) [Learn More](#) [Learn More \(45 Day Free Trial\)](#)

■ Rstudio download

- <https://www.rstudio.com/products/rstudio/download3/>



The screenshot shows the RStudio website's download page for version 0.99.903. The page includes a navigation menu with links for Products, Resources, Pricing, About Us, and Blog. The main content area features a heading for "RStudio Desktop 0.99.903 — Release Notes" and a note that RStudio requires R 2.11.1+. Below this, there are two sections: "Installers for Supported Platforms" and "Zip/Tarballs". Each section contains a table with columns for the installer name, size, date, and MD5 hash.

Installers for Supported Platforms

Installers	Size	Date	MD5
RStudio 0.99.903 - Windows Vista/7/8/10	77.1 MB	2016-07-18	716f28f2143c5e21f4acea5752e284f8
RStudio 0.99.903 - Mac OS X 10.6+ (64-bit)	60 MB	2016-07-18	d14a1585b5a5ac0839507b9c04d460d6
RStudio 0.99.903 - Ubuntu 12.04+/Debian 8+ (32-bit)	81.6 MB	2016-07-18	761eae80b0ba4d4cd9051a802a2c44e2
RStudio 0.99.903 - Ubuntu 12.04+/Debian 8+ (64-bit)	88.3 MB	2016-07-18	98ea59d3db0e0083d3e4053514f764d
RStudio 0.99.903 - Fedora 19+/RedHat 7+/openSUSE 13.1+ (32-bit)	81 MB	2016-07-18	ce2ea1023d99175cb909def0fe66eba7
RStudio 0.99.903 - Fedora 19+/RedHat 7+/openSUSE 13.1+ (64-bit)	81.9 MB	2016-07-18	152f247255e86904cf3354afbc7b3b99

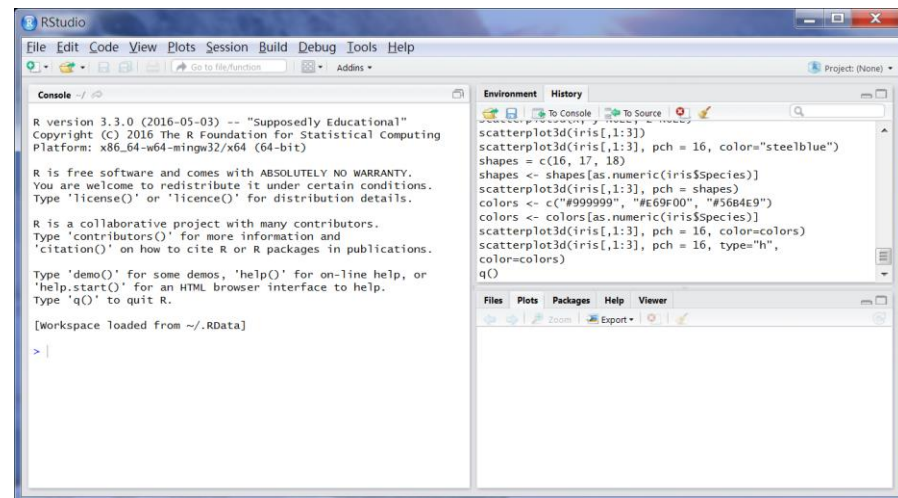
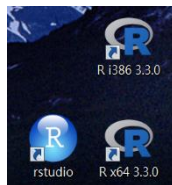
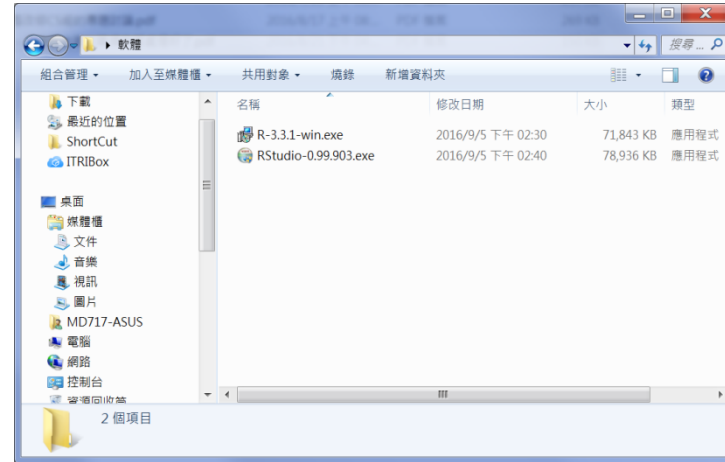
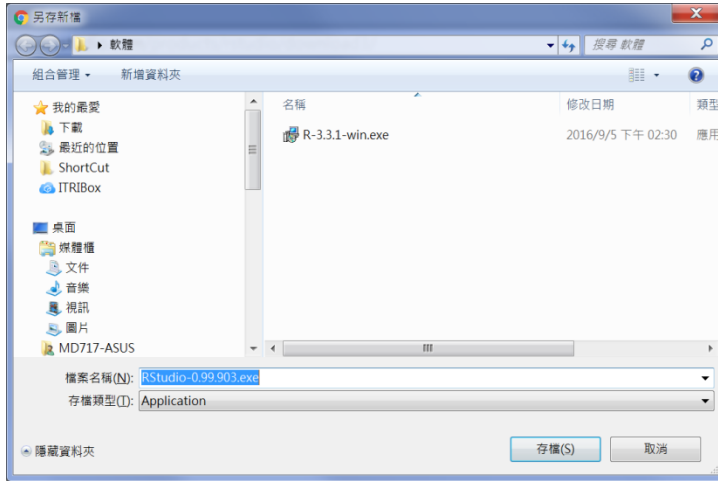
Zip/Tarballs

Zip/tar archives	Size	Date	MD5
RStudio 0.99.903 - Windows Vista/7/8/10	110.6 MB	2016-07-18	53817c5703a5fefbba513e6d05133e1d
RStudio 0.99.903 - Ubuntu 12.04+/Debian 8+ (32-bit)	82.3 MB	2016-07-18	bc2c16be996ed08200f1fde7b9e2b93a
RStudio 0.99.903 - Ubuntu 12.04+/Debian 8+ (64-bit)	89.2 MB	2016-07-18	44c418d506e395c70416df458b0788b2
RStudio 0.99.903 - Fedora 19+/RedHat 7+/openSUSE 13.1+ (32-bit)	81.6 MB	2016-07-18	c85a4e536fb71189744fba7aec9e35b5
RStudio 0.99.903 - Fedora 19+/RedHat 7+/openSUSE 13.1+ (64-bit)	82.8 MB	2016-07-18	ad5761417fa07cc4db7dfb91aa535b5a

Source Code

A tarball containing source code for RStudio v0.99.903 can be downloaded from [here](#)


RStudio 軟體安裝



次要軟體使用方式

- 平板 app 雲端連線：Android, iPad,
- 電腦 app 雲端連線：Windows, IOS
- <https://vdi.ntu.edu.tw/>
- <http://vdiqa.ntu.edu.tw/>

臺大虛擬桌面系統



WHAT'S VDI SOFTWARE LIST MANUAL NOTES FAQ

雲端電腦介紹

NTU VDI 台大虛擬桌面系統，利用最新的雲端運算提供跨平台的桌面虛擬化服務，讓使用者不受空間、地點、設備的限制裝置輕鬆存取計算機中心所提供的各類軟體資源及服務。NTU VDI 系統提供了「win7-cht」、「win7-eng」、「win7-cht-GPU」、「win7-eng-GPU」，四種作業系統而內裝的軟體詳如：[軟體清單](#)。

其中 GPU 系統讓使用者可以利用中心所提供的顯示卡資源做大量的圖型化運算，方便師生們做學術研究，相關作業請參閱各項說明。

NTU VDI 系統提供了跨平台、裝置的連線方式

1. 您可以利用任一種瀏覽器連線至<https://vdi.ntu.edu.tw>，但此方式不支援存取任一種USB裝置，其它使用限制詳如操作說明。
2. 或是在您的任一裝置上安裝 [VMware Horizon Client](#)，即可全功能使用。安裝說明請詳 NTU 雲端電腦操作說明 Windows 及 Mac 相關安裝說明請詳 NTU 雲端電腦操作說明

NTU VDI (NTU Virtual Desktop Interface), provides a cross-platform, virtual desktop service on the server. It allows the users to access the software and services provided by the school computer center, despite where and what kind of device you are using. OS allowed include "win7 - cht", "win7 - eng", "win7 - cht - gpu", "win7 - eng - gpu". The software's allowed in each kind of OS is listed in [Software List](#).


The GPU systems allow user to access the display card on the server for efficient manipulation of computer graphics. For further information regarding the gpu systems, please refer to our online pages.

You can connect to NTU VDI via the following ways:

1. Browse to the page <https://vdi.ntu.edu.tw>, but data transfer via usb port is not supported in this case.
2. Install VMware Horizon Client on the device, please refer NTU VDI user manual for details.

VMware Horizon Client Download

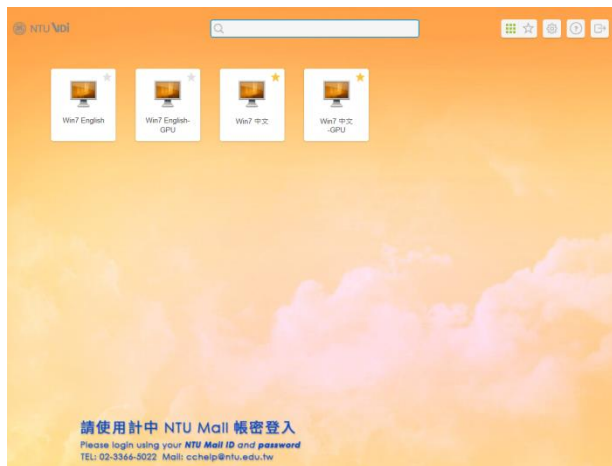
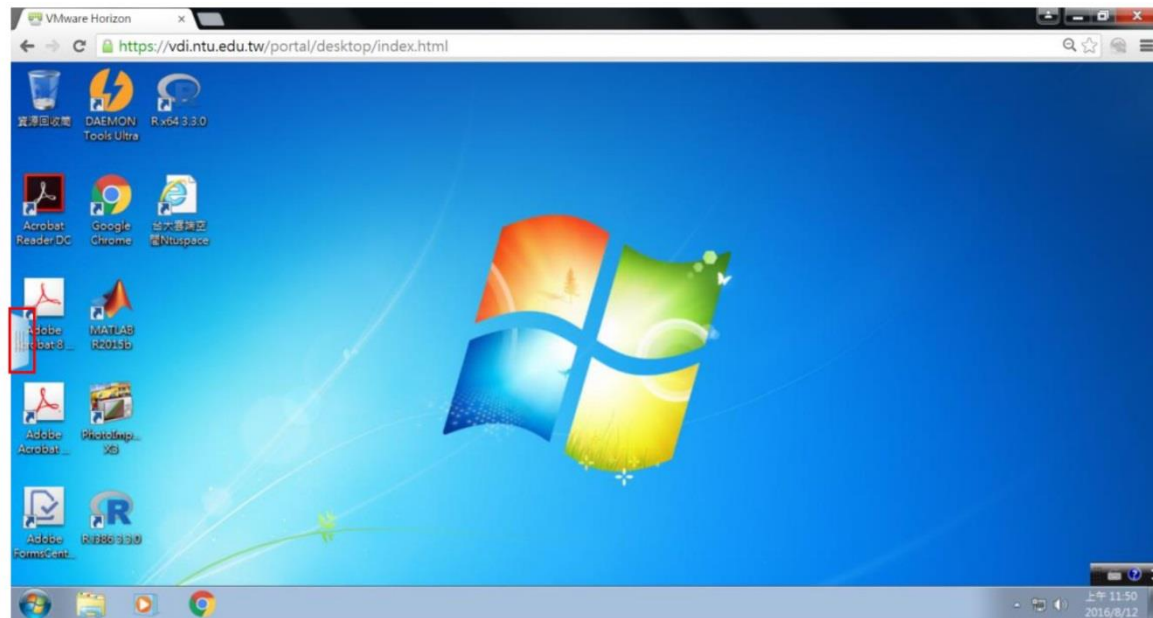
- [Windows 32](#)
- [Windows 64](#)
- [Mac](#)
- [Android](#)
- [ios](#)



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10617 臺北市羅斯福路四段一號 (02)3366-5009-5012 Email: net@ntu.edu.tw

次要軟體使用方式

- 桌機或筆電或平板 web 雲端連線：
- <https://vdi.ntu.edu.tw/>



- 操作手冊：
- <http://vdiqa.ntu.edu.tw/document.html>

臺大虛擬桌面系統



WHAT'S VDI SOFTWARE LIST MANUAL NOTES FAQ

操作說明

- [Windows 操作手冊](#)
- [IE、Chrome、Firefox 操作手冊](#)
- [IOS操作手冊](#)
- [Android 操作手冊](#)
- [Mac-OS 操作手冊](#)

程式軟體使用 - 工作目錄

- 建立一個工作目錄，存放檔案，

例如：`H:/MyData`

- 開啟 RStudio：點選 RStudio 捷徑

- 設定工作目錄：

點選 **Session / Set Working Directory / Choose Directroy**

選取目錄：`H:/MyData/`

可以看到：`setwd("H:/MyData")`

- 或者直接輸入：

`setwd("H:/MyData")`

- 檢查一下，輸入：

`getwd()`

- 會看到：

`[1] "H:/MyData"`

注意：

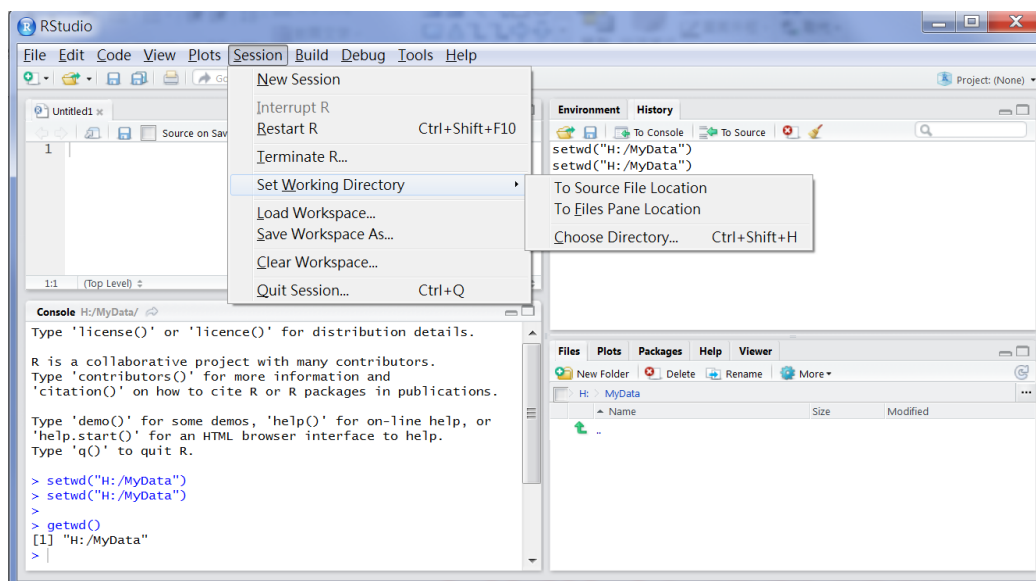
目錄名稱，不要有中文字，

包含：放在桌面，使用者等之下，

可能都會有中文字目錄。

建議在 `D:` or `E:` 等下面直接建目錄，

例如：`D:/MyData`, `E:/DataR`

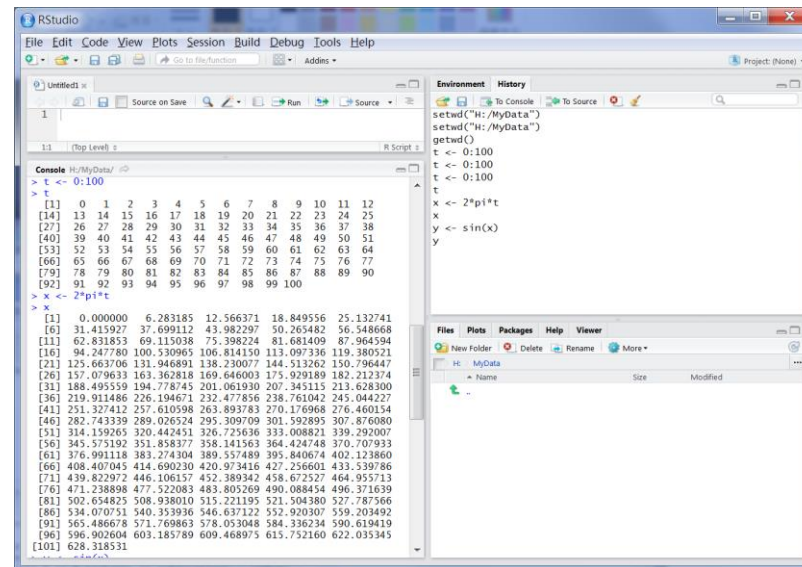


■ 建立一組數據，（數列）：

- `t <- 0:100`
- `x <- 2*pi*t/100`
- `y <- sin(x)`

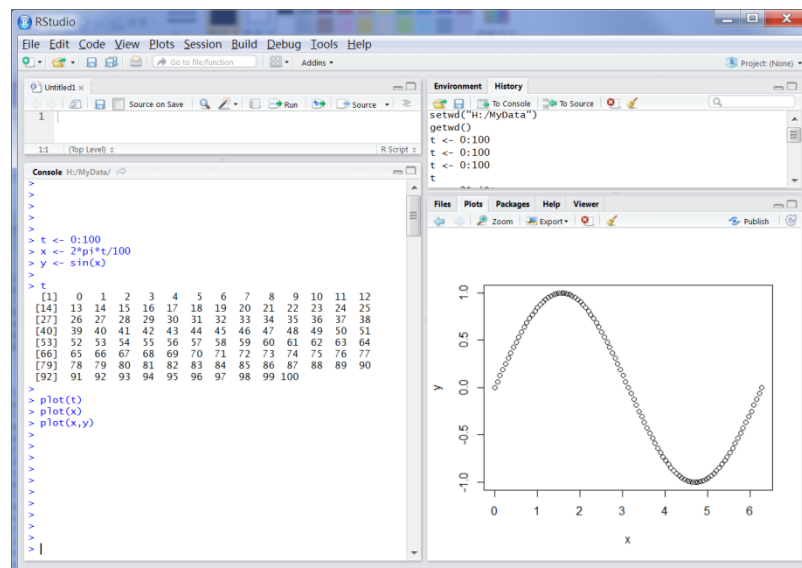
■ 繪圖：

- `plot(t)`
- `plot(x, y)`
- `plot(title, label)`

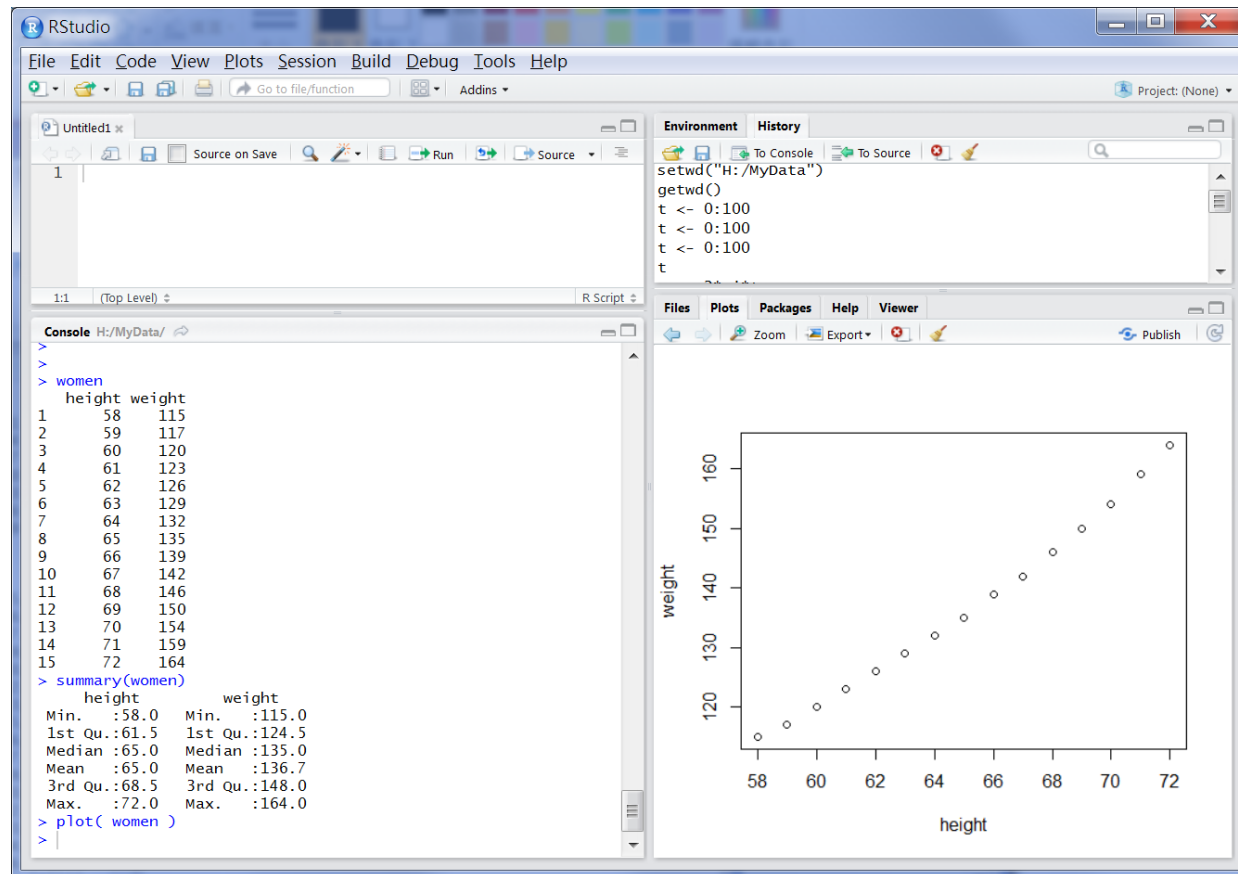


```
1  
t <- 0:100  
x <- 2*pi*t  
y <- sin(x)  
x  
y  
x <- 2*pi*t  
x  
y
```

t	x	y
0	0.000000	0.000000
1	0.062832	0.062832
2	0.125664	0.125664
3	0.188496	0.188496
4	0.251328	0.251328
5	0.314160	0.314160
6	0.376992	0.376992
7	0.439824	0.439824
8	0.502656	0.502656
9	0.565488	0.565488
10	0.628320	0.628320
11	0.691152	0.691152
12	0.753984	0.753984
13	0.816816	0.816816
14	0.879648	0.879648
15	0.942480	0.942480
16	1.005312	1.005312
17	1.068144	1.068144
18	1.130976	1.130976
19	1.193808	1.193808
20	1.256640	1.256640
21	1.319472	1.319472
22	1.382304	1.382304
23	1.445136	1.445136
24	1.507968	1.507968
25	1.570800	1.570800
26	1.633632	1.633632
27	1.696464	1.696464
28	1.759296	1.759296
29	1.822128	1.822128
30	1.884960	1.884960
31	1.947792	1.947792
32	2.010624	2.010624
33	2.073456	2.073456
34	2.136288	2.136288
35	2.199120	2.199120
36	2.261952	2.261952
37	2.324784	2.324784
38	2.387616	2.387616
39	2.450448	2.450448
40	2.513280	2.513280
41	2.576112	2.576112
42	2.638944	2.638944
43	2.701776	2.701776
44	2.764608	2.764608
45	2.827440	2.827440
46	2.890272	2.890272
47	2.953104	2.953104
48	3.015936	3.015936
49	3.078768	3.078768
50	3.141600	3.141600
51	3.204432	3.204432
52	3.267264	3.267264
53	3.330096	3.330096
54	3.392928	3.392928
55	3.455760	3.455760
56	3.518592	3.518592
57	3.581424	3.581424
58	3.644256	3.644256
59	3.707088	3.707088
60	3.769920	3.769920
61	3.832752	3.832752
62	3.895584	3.895584
63	3.958416	3.958416
64	4.021248	4.021248
65	4.084080	4.084080
66	4.146912	4.146912
67	4.209744	4.209744
68	4.272576	4.272576
69	4.335408	4.335408
70	4.398240	4.398240
71	4.461072	4.461072
72	4.523904	4.523904
73	4.586736	4.586736
74	4.649568	4.649568
75	4.712400	4.712400
76	4.775232	4.775232
77	4.838064	4.838064
78	4.900896	4.900896
79	4.963728	4.963728
80	5.026560	5.026560
81	5.089392	5.089392
82	5.152224	5.152224
83	5.215056	5.215056
84	5.277888	5.277888
85	5.340720	5.340720
86	5.403552	5.403552
87	5.466384	5.466384
88	5.529216	5.529216
89	5.592048	5.592048
90	5.654880	5.654880
91	5.717712	5.717712
92	5.780544	5.780544
93	5.843376	5.843376
94	5.906208	5.906208
95	5.969040	5.969040
96	6.031872	6.031872
97	6.094704	6.094704
98	6.157536	6.157536
99	6.220368	6.220368
100	6.283200	6.283200



- 使用內建的資料庫：
 - women
 - summary(women)
 - plot(women)



程式軟體使用 - 儲存至檔案

- 儲存工作內容資料至檔案 *.RData

- 點選 Session / Save Workspace As

輸入檔名： HW01_B01921001_Install (作業標號_學號)

在工作目錄，可以看到： HW01_B01921001_Install.RData

- 儲存歷史指令資料至檔案 *.Rhistory

- 點選右上視窗的 "History"
 - 點選 "磁碟片" 儲存歷史指令資料

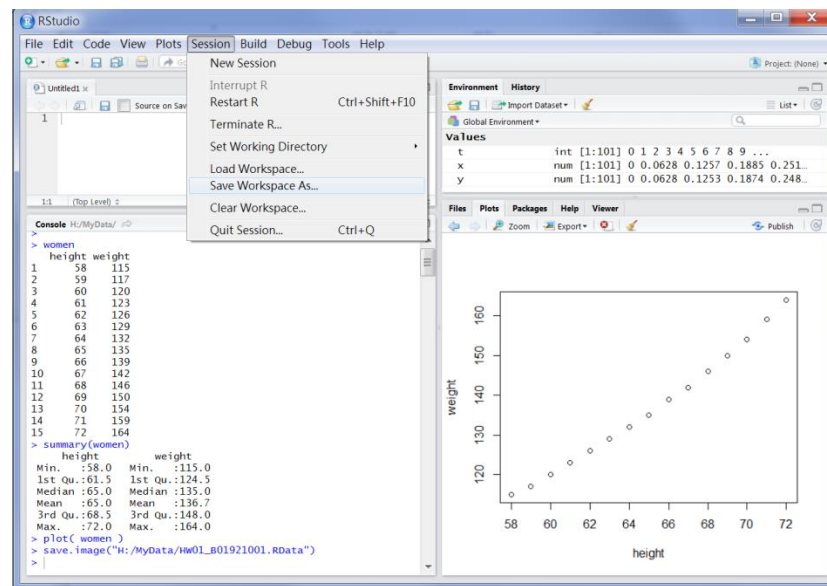
輸入檔名：

HW01_B01921001_Install

(作業標號_學號)

- 在工作目錄，可以看到：

HW01_B01921001_Install.Rhistory



程式軟體使用 - 儲存至檔案

■ 儲存主要指令資料至檔案 *.R

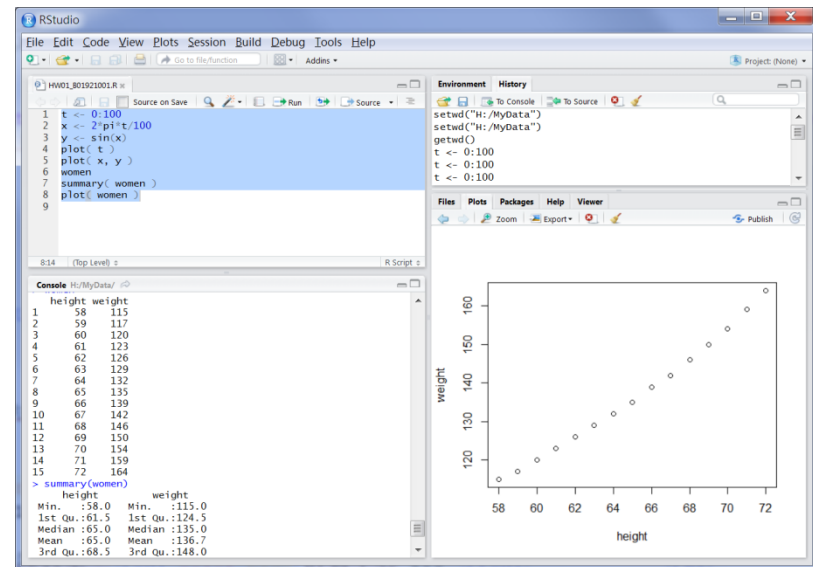
- 點選左上視窗，開啟一個空白的區間
- 輸入下面指令：

- `t <- 0:100`
- `x <- 2*pi*t/100`
- `y <- sin(x)`
- `plot(t)`
- `plot(x, y)`
- `women`
- `summary(women)`
- `plot(women)`

- 點選“磁碟片”儲存該指令資料

輸入檔名：`HW01_B01921001_Install` (作業標號_學號)

在工作目錄，可以看到：`HW01_B01921001_Install.R`



程式軟體使用

- 設定路徑 `setwd, getwd`
- 開啟檔案
- 載入資料庫
- 數列 `t <- 0:100; x <- 2*pi*t/100; y <- sin(x)`
- 繪圖 `plot(t); plot(x, y);`
- 開啟資料庫 `women`
- 資料庫內容 `summary(women)`
- 繪圖 `plot(women)`
- 儲存資料至檔案 `*.RData, *.Rhistory, *.R`
- 編輯結果 `*.pptx` 文字編輯，圖形複製，再轉成 `*.pdf`

名稱	修改日期	類型	大小
 HW01_B01921001.pptx	2016/9/18 上午 11:50	Microsoft PowerPo...	135 KB
 HW01_B01921001.R	2016/9/18 上午 11:37	R 檔案	1 KB
 HW01_B01921001.RData	2016/9/18 上午 11:15	R Workspace	4 KB
 HW01_B01921001.Rhistory	2016/9/18 上午 11:18	RHISTORY 檔案	1 KB

- 主旨：初步數據處理繪圖與程式檔案儲存
- 繳交下面檔案，檔案名稱：
 - HW01_學號_Install.xxx
 - 處理過程資料檔：HW01_B01921001_Install.RData
 - 歷史指定檔案：HW01_B01921001_Install.Rhistory
 - 主要指定檔案：HW01_B01921001_Install.R
 - 報告檔案：HW01_B01921001_Install.pdf
- 繳交方式與期限：
 - E-mail 上面四個檔案到：ntucp2018s@gmail.com
 - E-mail 主旨：HW01 B01921001 (就是，作業編號 and 您的學號)
 - 繳交期限：3/18 (Sun), 11pm 以前
- 學習方式：
 - 請至下面網址輸入此次的學習方式所花的時間：
 - https://docs.google.com/forms/d/e/1FAIpQLSdAZ_b-FUtvnNr_14rYQNYejMhDESy6jJ9ESh5XsjFI-DXMIw/viewform?c=0&w=1