ABSTRACT
In this catalog we compile information for all supernovae discovered by the All-Sky Automated Survey for SuperNovae (ASAS-SN) as well as all other bright (\(m_{\text{peak}} \leq 17\)), spectroscopically confirmed supernovae found in 2017, totaling 308 supernovae. We also present UV through near-IR magnitudes gathered from public databases of all host galaxies for the supernovae in the sample. We perform statistical analyses of our full bright supernova sample, which now contains 949 supernovae discovered since 2014 May 1, including supernovae from our previous catalogs. This is the fourth of a series of yearly papers on bright supernovae and their hosts from the ASAS-SN team.

Key words: supernovae, general — catalogues — surveys

1 INTRODUCTION
In recent years, large-scale, systematic surveys for supernovae (SNe) and other transient phenomena have become a cornerstone of modern astronomy. Significant examples of such surveys include the Lick Observatory Supernova Search (LOSS; Li et al. 2000), the Panoramic Survey Telescope & Rapid Response System (Pan-STARRS; Kaiser et al. 2002), the Texas Supernova Search (Quimby et al. 2008), the Sloan Digital Sky Survey (SDSS) Supernova Survey (Frieman et al. 2008), the Catalina Real-Time Transient Survey (CRTS; Drake et al. 2009), the CHilean Automatic Supernova sEarch (CHASE; Pignata et al. 2009), the Palomar Transient Factory (PTF; Law et al. 2009), the Gaia transient survey (Hodgkin et al. 2013), the La Silla-QUEST (LSQ) Low Redshift Supernova Survey (Baltay et al. 2013), the Mobile Astronomical System of TEslescopes Robots (MASTER; Garbovskoy et al. 2013) survey, the Optical Gravitational Lensing Experiment-IV (OGLE-IV; Wyrzykowski et al. 2014), the Asteroid Terrestrial-impact Last Alert System (ATLAS; Tonry 2011; Tonry et al. 2018), and the Zwicky Transient Facility (ZTF).

Despite the large number of transient surveys, however, prior to 2013 there was no high-cadence optical survey designed to survey the entire visible sky to find the brightest, nearby transients that can be observed in the greatest detail. Such events, while fewer in number, provide the opportunity to obtain the high-quality observational data needed to have the largest impact on our understanding of the physics behind transient phenomena.

The All-Sky Automated Survey for SuperNovae (ASAS-SN1; Shappee et al. 2014) was created for this purpose. ASAS-SN is designed to survey the entire visible sky to find the brightest transients. ASAS-SN has found many nearby and interesting SNe (e.g., Dong et al. 2016; Holoien et al. 2016a; Shappee et al. 2016; Godoy-Rivera et al. 2017; Bose et al. 2018a, b; Valley et al. 2018), tidal disruption events (TDEs; e.g., Holoien et al. 2014a; Brown et al. 2016; Holoien et al. 2016b; Prieto et al. 2016; Romero-Cañizales et al. 2016; Brown et al. 2017a; Holoien et al. 2018), stellar outbursts (Holoien et al. 2014b; Schmidt et al. 2014; Herceg et al. 2016; Schmidt et al. 2016), flares from active galactic nuclei (Shappee et al. 2014), black hole binaries (Tucker et al. 2018), and cataclysmic variable stars (Kato et al. 2014a, b, 2015, 2016).

Each ASAS-SN unit is hosted by the Las Cumbres Observatory (Brown et al. 2013) network and consists of four 14-cm telescopes, each with a 4.5 × 4.5 degree field-of-view. Until 2017, ASAS-SN comprised two units, each using V-band filters with a limiting magnitude of \(m_{\text{peak}} \sim 17\): Brutus, located on Haleakala in Hawaii, and Cassius, located at Cerro Tololo, Chile (see Shappee et al. (2014) for further technical details). In late 2017, ASAS-SN expanded with three new units: Paczynski, also located at Cerro Tololo, Leavitt, located at McDonald Observatory in Texas, and Payne-Gaposchkin, located in Sutherland, South Africa. Between the five units, ASAS-SN can now cover the entire observable sky (roughly 30000 square degrees) in less than a single night, with weather losses. Further, ASAS-SN switched to g-band for our new units, increasing our limiting magnitude to \(m_{\text{peak}} \sim 18.5\). Due to the increased depth, we will be switching our initial 8 telescopes to g-band as well by the end of 2018. For a more detailed history of the ASAS-SN project, see Holoien et al. (2017a) and Shappee et al. (2014).

All ASAS-SN data are automatically processed and are searched in real-time, with all discoveries being announced publicly if obvious or upon confirmation. This allows for both rapid discovery and response by the ASAS-SN team, as well as by others. The untargeted approach used by ASAS-SN and its 97% spectroscopic confirmation makes the ASAS-SN sample much less biased than many other SN searches. The ASAS-SN sample is thus ideal for population studies of nearby SNe and their hosts (e.g., Brown et al. 2018).

This manuscript is the fourth of a series of yearly catalogs provided by the ASAS-SN team. We present collected information on all SNe discovered by ASAS-SN in 2017 and their host galaxies. We also provide the same information for all bright SNe (those with \(m_{\text{peak}} \leq 17\)) discovered by other professional and amateur astronomers in the same year, as we have done with our previous catalogs (Holoien et al. 2017a, b, c). We also include whether ASAS-SN independently recovered these SNe after their initial discovery, to better quantify the completeness of our survey.

The analyses and information presented in this paper supersede information contained in discovery and classification Astronomer’s Telegrams (ATels), which are cited in this manuscript, and the publicly available information on
As a reminder, the proper name of any ASAS-SN transient is the ASAS-SN name. We participate in the TNS system to avoid confusion but strongly object to a naming scheme that does not credit the discoverer, even though this would be trivial to implement.

The catalog is organized as follows: in Section 2 we describe the sources of the information presented in this manuscript and list SNe with updated classifications and redshift measurements. In Section 3, we give statistics on the supernova and host galaxy populations in our full cumulative sample, including the discoveries listed in Holoien et al. (2017a,b,c), and discuss overall trends in the sample. Throughout our analyses, we assume a standard ΛCDM cosmology with \( H_0 = 69.3 \text{ km s}^{-1} \text{ Mpc}^{-1} \), \( \Omega_M = 0.29 \), and \( \Omega_\Lambda = 0.71 \) for converting host redshifts into distances. In Section 4, we summarize our overall findings and discuss future directions for the ASAS-SN survey and how they will impact future discoveries.

## 2 DATA SAMPLES

Below we outline the sources of the data collected in our supernova and host galaxy samples. These data are presented in Tables 1, 2, 3, and 4.

### 2.1 The ASAS-SN Supernova Sample

All information for supernovae discovered by ASAS-SN between 2017 January 1 and 2017 December 31 is given in Table 1. As in Holoien et al. (2017a,b,c), we obtained all supernova names, discovery dates, and host names from our discovery ATels, which are cited in Table 1. Also included in the table are the IAU names given to each supernova by TNS, which is the official mechanism for reporting new astronomical transients to the IAU. ASAS-SN continues to participate in the TNS system to avoid potential confusion over discoveries, but throughout this catalog we use the internal survey discovery names for each supernova as our primary nomenclature, and we encourage others to do the same to preserve the origins of new transients in future literature.

We measured all ASAS-SN supernova redshifts from classification spectra. For cases where the nominal supernova host galaxy had a previously measured redshift that is consistent with the transient redshift, we list the redshift of the host taken from the NASA/IPAC Extragalactic Database (NED). For other cases, we report the redshifts given in the classification telegrams or posted on TNS, with the exception of those that are updated in this work (see below).

Classifications were typically obtained using either the Supernova Identification code (SNID; Blondin & Tonry 2007) or the Generic Classification Tool (GELATO; Harutyunyan et al. 2008), which both compare observed input spectra to template spectra in order to estimate the supernova age and type.

Based on re-examining archival classification spectra of ASAS-SN discoveries available on TNS and the Weizmann Interactive Supernova data REPository (WISEREP; Yaron & Gal-Yam 2012), we update a number of redshifts and classifications that differ from what was previously reported. ASASSN-17bb, ASASSN-17ol, and ASASSN-17om have updated redshifts, and ASASSN-17io has an updated type based on archival spectra. We also report the classifications (and in some cases, redshifts) for a number of supernovae that were not previously publicly classified based on spectra obtained with the Wide Field Reimaging CCD Camera (WFCCD) mounted on the Las Campanas Observatory du Pont 2.5-m telescope and the Fast Spectrograph (FAST; Fabricant et al. 1998) mounted on the Fred L. Whipple Observatory Tillinghast 1.5-m telescope. ASAS-SN discoveries with new classifications include ASASSN-17ip, ASASSN-17js, ASASSN-17mf, ASASSN-17oh, and ASASSN-17ot. We report all updated redshifts and classifications in Table 1.

We solved astrometry in follow-up images taken of all ASAS-SN supernovae using the astrometry.net package (Barron et al. 2008; Lang et al. 2010) and measured centroid positions for the SNe using IRAF. This generally results in errors of \(<1^\prime\prime\) in position, significantly more accurate than positions measured directly from ASAS-SN images, which have a 7.0 pixel scale. Images used to measure astrometry were obtained using the Las Cumbres Observatory 1-m telescopes or by amateur collaborators who work with the ASAS-SN team. All coordinates announced in discovery ATels were measured from follow-up images in this way, and we report these coordinates in Table 1. The offsets between the SNe and the centers of their host galaxies are also reported in the Table, and these offsets were calculated using galaxy coordinates available in NED, or measured from archival images in cases where a host center was not previously catalogued.

We remeasured V-band, host-subtracted peak magnitudes from ASAS-SN data for all ASAS-SN supernova discoveries. In addition, as the three new units deployed last year use g-band filters, we also remeasured g-band peak magnitudes for each ASAS-SN supernova that was discovered after the new units were deployed. Both magnitudes are reported in Table 1. In some cases, due to the way ASAS-SN fields were divided between cameras and because the new units were still building reference images in late 2017, SNe were only detected in a single filter. We also report discovery magnitudes in the discovery filter measured from the re-subtracted light curves. In some cases, these magnitudes differ from the magnitudes reported in the original discovery ATels or on TNS, as re-reduction of the data has led to improvements in the photometry. As we did in the previous ASAS-SN catalogs, we define the “discovery magnitude” as the magnitude of the SN on the date it was discovered. For supernovae with enough detections in their light curves (for either or both filters), we also performed parabolic fits to the
light curves and estimate peak magnitudes based on the fits. The “peak magnitude” for each filter reported in Table 1 is the brighter value between the peak of the parabolic fit and the brightest magnitude measured in the light curve.

As in Holoien et al. (2017a,b,c), all supernovae discovered by ASAS-SN in 2017 are included in this catalog, including those fainter than $m_V = 17$ or $m_g = 17$. When performing comparison analyses that are presented in Section 3, we only include those ASAS-SN discoveries with $m_{peak} \leq 17$ so that our sample is consistent with the non-ASAS-SN sample.

### 2.2 The Non-ASAS-SN Supernova Sample

Table 2 contains information for all spectroscopically confirmed SNe discovered by other professional and amateur SN searches between 2017 January 1 and 2017 December 31 with peak magnitudes of $m_{peak} \leq 17$.

As in our previous catalogs, the list of non-ASAS-SN discoveries was generated from the “latest supernovae” website designed and maintained by D. W. Bishop (Gal-Yam et al. 2013). Discoveries reported via different channels (including TNS and ATels) are compiled on this website, and objects reported by different sources at different times are linked, making it an ideal source for information on supernovae discovered by different groups. As some supernova searches do not participate in the TNS system, we used TNS only for verifying data from the latest supernova website, and not as a primary source of information for non-ASAS-SN discoveries.

We obtained supernova names, IAU names, discovery dates, coordinates, host offsets, peak magnitudes, spectral types, and discovery sources for each supernova in the non-ASAS-SN sample from the latest supernova website, when possible. NED was used to gather host galaxy names and redshifts when available, with the SN redshifts on the latest supernova website being used in other cases. If a host offset was not listed on the website, the offset was taken from NED, with the offset being defined as the angular separation between the reported coordinates of the supernova and the galaxy coordinates in NED.

In some cases, a host galaxy was clearly visible in archival Pan-STARRS data (Chambers et al. 2016) despite no host galaxy being listed at the position of the host in NED. For such cases we used IRAF to measure a centroid position of the host to use to calculate the offset. All host galaxy names listed for both the ASAS-SN and non-ASAS-SN samples are the primary names of the host galaxies from NED, which in some cases differ from the names listed on the ASAS-SN supernova page or the latest supernova website.

The magnitudes from the latest supernova website are reported in different filters from various telescopes, and in many cases the reported photometry does not necessarily cover the actual peak of the supernova light curve. For the purposes of having a more consistent sample of supernova peak magnitudes between the ASAS-SN sample, which uses peak magnitudes measured from ASAS-SN data, and the non-ASAS-SN sample, we also produced re-reduced, host-subtracted $V$- and $g$-band ASAS-SN light curves for every non-ASAS-SN supernova in the 2017 sample. As we did with the ASAS-SN sample, we also performed parabolic fits to the light curves with enough detections, and used the brighter of the brightest measured magnitude and the peak of the fit as the peak magnitude for each filter, when a supernova was detected. These peak ASAS-SN $V$- and $g$-band magnitudes are also listed in Table 2 for each supernova that was detected.

We find that only 9 supernovae from the 2017 non-ASAS-SN sample are not detected in this re-measurement despite 48 of these supernovae not being recovered during normal survey operations. This is likely due to better-quality light curves being produced in this re-reduction, and the fact that our re-reduction ensures no supernova light is contained in the reference image, and thus subtracted from the light curve.

We performed a similar re-reduction and peak magnitude measurement for each supernova in the 2014-2016 non-ASAS-SN samples, and use only ASAS-SN $V$-band magnitudes when looking at the peak magnitude distribution and sample completeness in Section 3. The ASAS-SN light curves for all supernovae in these samples will be released in a future manuscript (Ping et al., in prep.)

As we did with the ASAS-SN sample, we also re-checked the redshifts and classifications of the non-ASAS-SN supernovae using publicly available spectra on TNS and WISEREP. Based on our re-examination of these spectra, we update the classifications of ATLAS17cpj and ATLAS17evm and the redshift of ATLAS17cpj. In addition, the supernova SN 2017gfj has a measured redshift of $z \sim 0.072$, but has been publicly announced as being hosted in the galaxy UGC 11950, which has a redshift of $z = 0.020541$. This was likely done because UGC 11950 is the nearest catalogued galaxy to the SN, but based on the redshift discrepancy we believe it likely that SN 2017gfj was actually located in an uncatalogued background galaxy, and we update the host name in our sample accordingly. We assume the SN redshift of $z \sim 0.072$ for SN 2017gfj in our analyses presented in Section 3. All updated types and redshifts are reported in Table 2.

For all supernovae discovered by other professional surveys, we list the name of the discovery group in Table 2. We use “Amateurs” as the discovery source for supernovae discovered by non-professional astronomers, to differentiate these supernovae from those discovered by ASAS-SN and other professional surveys. Unlike in previous years, amateurs no longer account for the second largest number of bright supernova discoveries after ASAS-SN, with the ATLAS survey (Tonry 2011; Tonry et al. 2018) now holding that distinction. Amateurs still account for the third largest number of bright supernova discoveries in 2017, however, showing they are still a significant source of bright discoveries.

Finally, as in our previous catalogs, we also note in Table 2 whether or not the supernovae in the non-ASAS-SN sample were independently recovered by the ASAS-SN team during normal survey operations. This allows us to quantify the impact ASAS-SN has on the discovery of bright supernovae in the absence of other supernova searches.

### 2.3 The Host Galaxy Samples

For both supernova samples, we collected Galactic extinction estimates in the directions of the host galaxies and host
magnitudes spanning from the near-ultraviolet (NUV) to the infrared (IR) wavelengths. These data are presented in Tables 3 and 4 for ASAS-SN hosts and non-ASAS-SN hosts, respectively. We obtained the values of Galactic $A_V$ from Schlafly & Finkbeiner (2011) in the directions of the supernovae from NED. NUV host magnitudes from the Galaxy Evolution Explorer (GALEX; Morrissey et al. 2007) All Sky Survey, optical $ugriz$ magnitudes from the Sloan Digital Sky Survey Data Release 14 (SDSS DR14; SDSS Collaboration et al. 2016), NIR $JHK$ magnitudes from the Two-Micron All Sky Survey (2MASS; Skrutskie et al. 2006), and IR $W$ and $W1$ from the Wide-field Infrared Survey Explorer (WISE; Wright et al. 2010) AllWISE source catalogs were obtained from publicly available online databases.

For host galaxies that were not detected in 2MASS, we adopted an upper limit in the $J$ and $H$ filters corresponding to our faintest detected host in our combined 2014 – 2017 sample ($m_J > 17.0$, $m_H > 16.4$). When hosts were not detected in 2MASS but were detected in WISE $W1$ data, we estimated a $K_S$ host magnitude by adding the mean $K_S – W1$ offset from the combined sample to the WISE $W1$ data. We calculated this mean offset by averaging the offsets for all hosts detected in both $K_S$ and $W1$ data from both the ASAS-SN and non-ASAS-SN samples from 2014 May 1 through 2017 December 31. This results in an average offset of $0.51$ magnitudes with a scatter of $0.04$ magnitudes and a standard error of $0.002$ magnitudes, matching the numbers we found when doing the same calculation for the 2014–2016 sample in Holoien et al. (2017c). For hosts not detected in either 2MASS or WISE data, we adopt an upper limit of $m_{K_S} > 15.6$, which corresponds to the faintest $K_S$-band host magnitude in our sample.

3 ANALYSIS OF THE SAMPLE

The total sample of bright supernovae discovered by all sources between 2014 May 01, when ASAS-SN began operating in the Southern hemisphere, and 2017 December 31 now includes 949 supernovae, after excluding ASAS-SN discoveries with $m_{peak,V} > 17.0$ and $m_{peak,g} > 17.0$ (Holoien et al. 2017a,b,c). 56% (528) of these supernovae were ASAS-SN discoveries, 19% (176) were discovered by amateur astronomers, and 26% (245) were discovered by professional surveys. Breaking the sample down by type, 655 were Type Ia supernovae, 233 were Type II supernovae, 58 were type Ib/Ic supernovae, and 3 were superluminous supernovae. For the purpose of these analyses, we consider Type Ib supernovae as part of the Type II sample so that we can more directly compare with the results of Li et al. (2011), as we have done in our previous catalogs. The object ASASSN-15lh, either an extremely luminous Type I SLSN (Dong et al. 2016; Godoy-Rivera et al. 2017) or a tidal disruption event (Leloudas et al. 2016), is excluded from the following analysis.

Figure 1 shows the breakdown by type of the supernovae in the ASAS-SN, non-ASAS-SN, and total samples. As is expected for a magnitude-limited sample (e.g., Li et al. 2011), Type Ia supernovae represent the largest fraction in each of the three samples. As we have seen in our previous catalogs, the ASAS-SN sample continues to match the “ideal magnitude-limited sample” predicted from the LOSS sample in Li et al. (2011), where there are 79% Type Ia, 17% Type II, and 4% Type Ib/Ic, almost exactly. Due to the observing strategies of the various discovery sources in the non-ASAS-SN sample not necessarily being magnitude-limited in all cases (e.g., because the survey targets certain types of galaxies or takes a volume-limited approach), the other two samples have higher fractions of core-collapse supernovae than the ASAS-SN sample.

ASAS-SN accounts for 56% of the bright supernovae in our total sample, and thus remains the dominant source of bright supernova discoveries despite new surveys like ATLAS coming online in 2017. A large fraction of the ASAS-SN sample continues to be discovered shortly after explosion because of our high cadence. Of the 459 ASAS-SN discoveries with approximate discovery ages, 70% (322) were discov-
Figure 2. **Upper Panel:** The offset of all supernovae in our 2014 – 2017 combined sample from their host nuclei in arcseconds compared to the absolute $K_S$-band host magnitude. The $\log (L/L_\star)$ values that correspond to the magnitude range shown on the bottom scale are shown on the top axis, assuming $M_{\star,K_S} = -24.2$ (Kochanek et al. 2001). Red stars, black circles, and blue squares denote ASAS-SN discoveries, amateur discoveries, and other professional discoveries, respectively. Upper limits on the host galaxy magnitudes for hosts that are not detected in 2MASS or WISE are indicated with triangles in corresponding colors. Filler points indicate supernovae that were discovered or independently recovered by ASAS-SN. The median host magnitudes and offsets are indicated with dashed, dotted, and dash-dotted lines for ASAS-SN discoveries, amateur discoveries, and other professional discoveries, respectively, in colors that correspond to those of the matching data points. **Lower Panel:** As above, but with the offset measured in kiloparsecs.
Figure 3. Cumulative, normalized distributions of host galaxy absolute magnitudes (upper panel), offset from host nucleus in arcseconds (center panel), and offset from host nucleus in kpc (bottom panel) for the ASAS-SN supernova sample (red), the other professional sample (blue), and the amateur sample (black). As is seen in Figure 2, amateur discoveries are biased towards more luminous hosts than professional surveys, and ASAS-SN continues to find supernovae at smaller offsets than either comparison group, regardless of how the offset is measured.

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Figure 2 shows the host galaxy $K_S$-band absolute magnitudes compared to the offsets of the supernovae from their host centers for all supernovae in our sample. The Figure shows the ASAS-SN, amateur, and other professional samples as different colors, and also shows the median offsets and magnitudes for each source. We also give a luminosity scale corresponding to the magnitude scale to put the magnitude scale in perspective, assuming that an $L_\star$ galaxy has $M_{K_S} = -24.2$ (Kochanek et al. 2001).

As we have seen in the previous ASAS-SN catalogs, amateur discoveries are significantly biased towards more luminous hosts and larger offsets from the host galaxy nucleus (Holoien et al. 2017a,b,c). This is unsurprising given that amateur supernova searches tend to observe the brightest, nearest galaxies and use less sophisticated detection techniques than professional surveys. Discoveries made by other professional surveys continue to exhibit a smaller median angular separation than amateur discoveries (median value of 10.4' compared to 17.3'), and now show a smaller median offset in physical separation as well (4.5 kpc vs. 5.7 kpc). This is in contrast to previous years, when the median physical offset was similar between the two groups (e.g., Holoien et al. 2017c). ASAS-SN remains less biased against discoveries close to the host nucleus than either group, with the ASAS-SN discoveries showing median offsets of 4.5'' and 2.4 kpc.

The median host galaxy magnitude for ASAS-SN discoveries is $M_{K_S} = -22.7$, compared to $M_{K_S} = -22.9$, and $M_{K_S} = -23.9$ for other professional surveys and amateurs, respectively. This is similar to the trend we have seen in our previous years’ catalogs, where there is a clear distinction in host luminosity between professional surveys (including ASAS-SN) and amateurs (Holoien et al. 2017a,b,c).

The cumulative distributions of host galaxy magnitudes and offsets from host nuclei are shown in Figure 3. The Figure shows clearly that the amateur supernova sample stands out from the ASAS-SN and other professional samples in excess.
host galaxy luminosity. It also shows that supernovae discovered by ASAS-SN are more concentrated towards the centers of their hosts, and that those discovered by other professionals fall between the ASAS-SN sample and the amateur sample in offset. A larger fraction of the other professional sample was discovered by surveys that use difference imaging in 2017, largely due to the ATLAS survey. While ASAS-SN remains the dominant source of bright supernova discoveries, ATLAS has now surpassed amateur astronomers to become the second largest contributor of bright supernova discoveries.

Despite the contribution of ATLAS, ASAS-SN continues to find supernovae with smaller median offsets than its competitors, and still has a smaller median offset than the ASAS-SN sample and the amateur sample to be more easily applied to supernova rate studies. The majority of very bright (mpeak ≲ 14.5; Holoien et al. 2017b) supernovae are discovered by amateurs or the Distance Less Than 40 Mpc (DLT40) survey6, both of which typically survey the brightest and nearest galaxies rather than taking an unbiased, all-sky approach. However, ASAS-SN recovers the vast majority of these supernovae, and in 2017 ASAS-SN discovered or recovered every supernova with mpeak < 15.3, a significant improvement from 2016, when we only discovered or recovered everything with mpeak < 14.3 (Holoien et al. 2017c).

Figure 6 also gives an illustration of the estimated completeness of our sample. We used a broken power-law fit, shown as a green dashed line in the Figure, to model the distribution of the observable supernovae brighter than mpeak = 17.01. This fit assumes a Euclidean slope below the break magnitude and a variable slope above it. We used Markov Chain Monte Carlo methods to derive the parameters of the fit. Similar to what we found in the 2016 catalog, we find that the best-fit break magnitude is m = 16.24 ± 0.11 for the complete sample, meaning that the number counts are consistent with a Euclidean slope for magnitudes brighter than 16.24.

The integral completeness of our total sample relative to Euclidean predictions is 0.95 ± 0.03 at m = 16.5 and 0.73 ± 0.03 at m = 17.0. The differential completeness relative to Euclidean predictions is 0.71 ± 0.07 at m = 16.5 and 0.36 ± 0.04 at m = 17.0. These results are very similar to what we found in Holoien et al. (2017c) and imply that roughly 70% of the supernovae brighter than mpeak = 17 and roughly 30% of the mpeak = 17 supernovae are being

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6 http://dark.physics.ucdavis.edu/dlt40/DLT40

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found. We note that the Euclidean approximation we use for this analysis does not take into account any deviations from Euclidean geometry, K-corrections, or effects of time dilation on supernova rates, so it likely underestimates the true completeness for faint supernovae slightly. We will include these higher order corrections when carrying out a full analysis of nearby supernova rates.

4 CONCLUSIONS
This manuscript presents a comprehensive catalog of spectroscopically confirmed bright supernovae and their hosts, totaling 308 new supernovae discovered in 2017. Our total combined bright supernova sample now includes 949 supernovae, with 528 of these discovered by ASAS-SN and an additional 216 independently recovered by ASAS-SN after discovery. The ASAS-SN sample remains extremely similar to that of an ideal magnitude-limited sample from Li et al. (2011), while the combined sample has a similar distribution but with a larger proportion of core-collapse supernovae relative to Type Ia supernovae than expected.

ASAS-SN remains the only professional survey to provide a complete, rapid-cadence, all-sky survey of nearby transients, and with the expansion of our telescope network in 2017, it will have an even greater impact on the discovery and follow-up of bright supernovae going forward. The ATLAS survey is now the primary competition to ASAS-SN for new discoveries, though amateur astronomers still discover a significant fraction of the brightest supernovae and discover the third most supernovae in our 2017 sample overall. Despite the advent of recent professional surveys like ATLAS, ASAS-SN continues to find supernovae closer to galactic nuclei than its competitors (Figure 2), and finds supernovae that would not be found otherwise (Figure 4). ASAS-SN recovered the majority of bright supernovae that it did not discover in 2017, as was the case in 2015 and 2016, and it recovered or discovered all supernovae with $m_{peak} \leq 15.3$ in 2017.

Similar to what we found in Holoien et al. (2017c), our total sample is roughly complete to a peak magnitude of $m_{peak} = 16.2$, and is roughly 70% complete for $m_{peak} \leq 17.0$. This analysis served as the precursor to our first supernova rates paper, where we found that the specific Type Ia supernova rate rises as host galaxy mass decreases (Brown et al. 2018). Manuscripts with further rate calculations with respect to other host properties (e.g., star formation rate and metallicity) and an overall nearby supernova rate paper are in preparation, and will have a significant impact on a number of fields of astronomy, including the nearby core-collapse rate (e.g., Horiuchi et al. 2011, 2013) and multi-messenger studies ranging from gravitational waves (e.g., Ando et al. 2013; Nakamura et al. 2016), to MeV gamma rays from Type Ia supernovae (e.g., Horiuchi & Beacom 2010; Diehl et al. 2014; Churazov et al. 2015) to GeV–TeV gamma rays and neutrinos from rare types of core-collapse supernovae (e.g., Ando & Beacom 2005; Murase et al. 2011; Abbasi et al. 2012). Joint measurements such as these will greatly increase the scientific reach of ASAS-SN.

This is the fourth of a yearly series of catalogs of bright supernovae and their hosts provided by the ASAS-SN team. It is our hope that these catalogs will provide useful data repositories for bright supernova and host galaxy properties that can be used for new and interesting population studies. As ASAS-SN continues to dominate the discovery of the best and brightest transients in the sky, this is just one way in which we can use our unbiased sample to impact supernova research.

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Figure 6. Cumulative histogram of peak supernovae $V$-band magnitudes with a 0.1 magnitude bin width. ASAS-SN discoveries are shown with a red line, supernovae discovered or recovered by ASAS-SN are shown with a blue line, and all supernovae in the sample are shown with a black line. The broken power-law fit shown with a green dashed line has been normalized to the complete sample, and has a Euclidean slope below the break magnitude and a variable slope above it. The magenta dashed line shows the Euclidean slope extrapolated to $m = 17$, and the sample is approximately 70% complete for $m_{peak} < 17$. Only supernovae with ASAS-SN $V$-band light curves are included in this Figure.
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## Table 1. ASAS-SN Supernovae

| SN Name | IAU Name | Discovery Date |
|---------|----------|----------------|
| ASASSN-17ac | 2017ad | 2017-01-04.36 |
| ASASSN-17ad | 2017af | 2017-01-05.51 |
| ASASSN-17be | 2017bg | 2017-01-09.63 |
| ASASSN-17bi | 2017bj | 2017-01-23.67 |
| ASASSN-17bk | 2017bl | 2017-01-23.61 |
| ASASSN-17bn | 2017bn | 2017-01-21.43 |
| ASASSN-17bo | 2017bo | 2017-01-27.51 |
| ASASSN-17br | 2017br | 2017-01-30.66 |

## Table 2. Non-ASAS-SN Supernovae

| SN Name | IAU Name | Discovery Date |
|---------|----------|----------------|
| 2017hr | 2017hr | 2017-01-06.69 |
| PS17bi | 2017bi | 2017-01-09.21 |
| 2017ih | 2017ih | 2017-01-09.41 |
| ATLAS17ajn | 2017ajn | 2017-01-14.63 |
| MAST-OT 20180613+381123 | 20180613+381123 | 2017-01-21.71 |
| ATLAS17bkk | 2017bkk | 2017-01-23.71 |
| ATLAS17baby | 2017baby | 2017-01-26.31 |
| ATLAS17h | 2017h | 2017-01-21.09 |
| PTSS-17dfc | 2017dfc | 2017-02-11.71 |
| ATLAS17bkw | 2017bkw | 2017-02-15.71 |
| ATLAS17b | 2017b | 2017-02-15.71 |
| ATLAS17b | 2017b | 2017-02-11.71 |
| ATLAS17ahc | 2017ahc | 2017-02-21.09 |
| MASTER 008352+6303128 | 008352+6303128 | 2017-02-11.73 |
| Gaiabad | 2017ad | 2017-02-14.63 |
| DLT17h | 2017h | 2017-02-08.36 |
| MASTER 008352+6303128 | 008352+6303128 | 2017-02-11.73 |
| PS17bi | 2017bi | 2017-02-14.58 |
| PTSS-17b | 2017b | 2017-02-15.71 |
| ATLAS17b | 2017b | 2017-02-11.71 |

This table is available in its entirety in a machine-readable form in the online journal. A portion is shown here for guidance regarding its form and content.

- **RA**: Right ascension and declination are given in the J2000 epoch.
- **Dec**: Magnitudes are taken from D. W. Bishop's Bright Supernova website, as described in the text, and may be from different filters.
- **Offset**: Indicates whether the supernova was independently recovered in ASAS-SN data or not.
| Galaxy Name | Redshift | SN | Offset | Type | (arcsec) |
|-------------|----------|-----|--------|------|----------|
| 2MASX J143422.28-381408.9 | 0.13302 | ASASSN-17ac | Ia | 6.09 | 0.290 |
| 2MASX J140232.42+394335.9 | 0.20060 | ASASSN-17ad | Ia | 3.92 | 0.182 |
| MCG-01-032-004 | 0.00977 | ASASSN-17ae | Ia | 4.00 | 0.400 |
| NGC 4631 | 0.00109 | ASASSN-17af | Ia | 4.00 | 0.000 |
| 2MASX J16170338+1041359 | 0.05027 | ASASSN-17ae | Ia | 11.50 | 0.166 |
| 2MASX J11383367+2523532 | 0.02536 | ASASSN-17at | Ia | 0.58 | 0.125 |
| 2MASX J07101346+2712041 | 0.06100 | ASASSN-17bc | Ia | 6.18 | 0.169 |
| 2MASX J15204087+0439331 | 0.03000 | ASASSN-17bb | Ia | 1.86 | 0.121 |
| 2MASX J02031063-6141105 | 0.04000 | ASASSN-17be | Ia | 0.51 | 0.096 |
| CGCG 223-033 | 0.03186 | ASASSN-17bh | Ia | 14.52 | 0.038 |
| GALEXASC J020208.73-175958.3 | 0.05100 | ASASSN-17bp | Ia | 3.45 | 0.075 |
| GALEXASC J155200.16+661851.6 | 0.02600 | ASASSN-17br | IIP | 3.71 | 0.075 |
| GALEXASC J020550.53 0.022000 | ATLAS17abh | Ia | 4.74 | 0.203 |
| IC 5334 | 0.007368 | PS17hj | Ia | 1.26 | 0.114 |
| UGC 08204 | 0.023853 | 2017hn | Ia | 4.66 | 0.091 |
| 2MASX J00573150+3011098 | 0.016331 | ATLAS17air | Ia | 5.88 | 0.201 |
| SDSS J102641.99+364053.2 | 0.024639 | PTSS-17dfc | Ia | 5.22 | 0.027 |
| 2MASX J02491020+1436036 | 0.027900 | ATLAS17alb | Ia | 2.88 | 0.299 |
| SDSS J13324217-2148034 | 0.02947 | ATLAS17auc | Ia | 1.38 | 0.232 |
| GALEXASC J134322.97 0.030000 | ATLAS17axb | Ia | 3.84 | 0.300 |
| KUG 0945+674 | 0.01305 | Gaia17aiq | IIb | 38.6 | 0.327 |
| NGC 3318 | 0.009255 | DLT17h | II | 40.32 | 0.212 |
| CGCG 421-034 | 0.027426 | ATLAS17bam | Ia | 23.46 | 0.319 |

Uncertainty is given for all magnitudes, and in some cases this is zero. "MASTER" supernova names and "GALEXASC" galaxy names have been abbreviated.

Galactic extinction taken from Schlafly & Finkbeiner (2011).

No magnitude is listed for those galaxies not detected in SDSS data or those located outside of the SDSS footprint.

K-band magnitudes marked with a * indicate those estimated from the WISE 1-band data, as described in the text.

TABLE 4. Non-ASAS-SN Supernova Host Galaxies

This table is available in its entirety in a machine-readable form in the online journal. A portion is shown here for guidance regarding its form and content.